

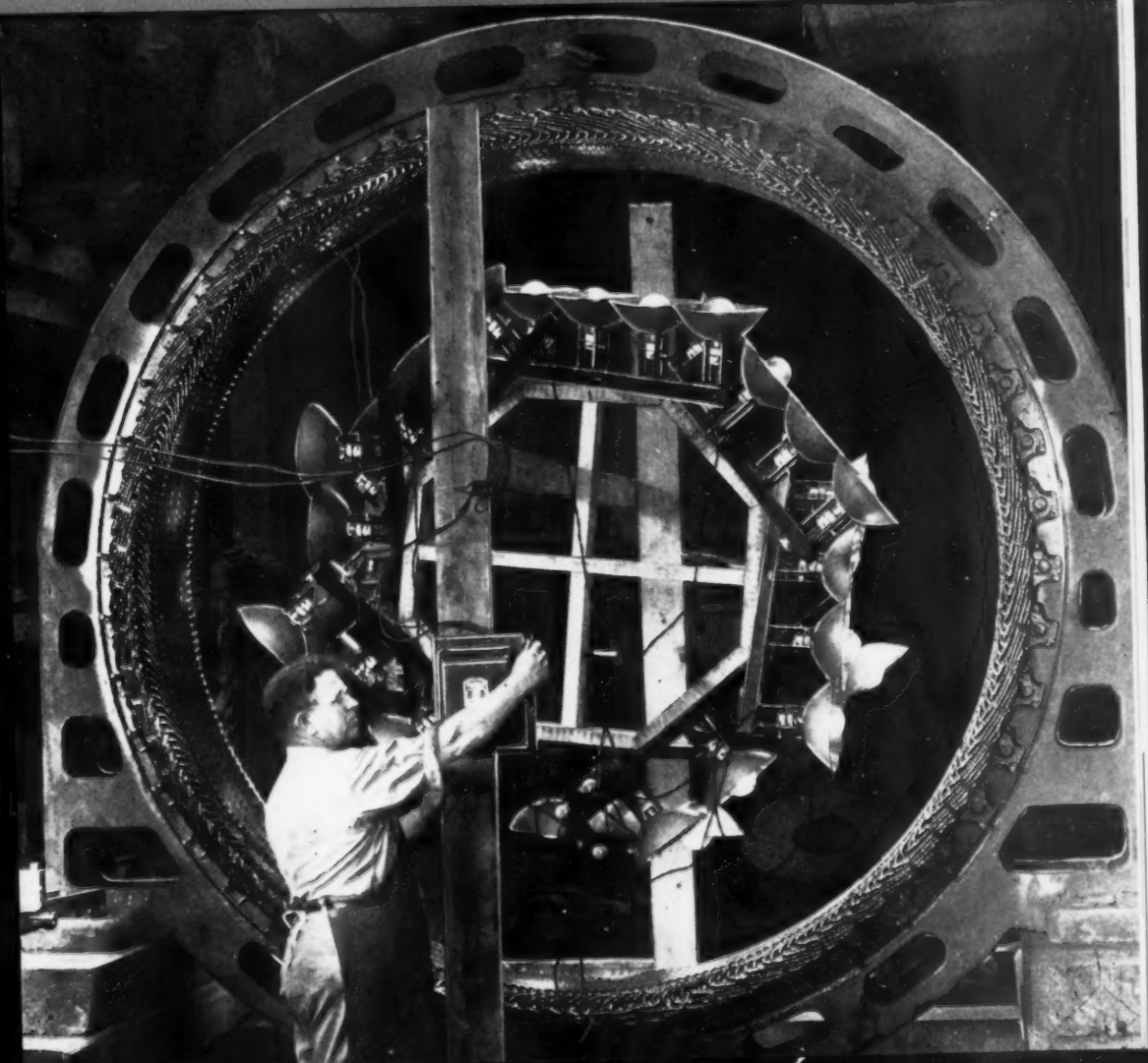
Electrical Contracting

THE MAGAZINE OF ELECTRICAL CONSTRUCTION

FEBRUARY, 1942

Flexible, adaptable, safe radiant heat for industrial baking and drying is a war baby to watch. It fits anywhere, heats instantly and saves critical materials. For design data on infra-red installations see Page 22.

**INDUSTRIAL ELECTRIFICATION
SECTION
PAGES 53-64**



For Low-maintenance Fluorescent Installations

...Make Sure the
Ballasts are **G-E**



BALLAST DESIGN and construction are among the most important factors that affect the performance and economy of MAZDA F lamp installations. Poorly designed ballasts may result in early end-blackening of lamps, will frequently aggravate the effects of line-voltage variations, and can materially shorten lamp life.

For best lamp operation, with low maintenance, the electrical characteristics of the ballasts must be carefully co-ordinated with those of the lamps. In addition, the ballast-manufacturing processes must be rigidly controlled to obtain uniformity of characteristics in all units of the same rating.

Both of these requirements are met by the complete line of G-E ballasts for MAZDA F lamps. The designs of all ratings conform to the specifications of the lamp manufacturers. Uniformity is maintained by automatic winding of coils, silver soldering of all connections, machine assembly of core and coils, and by other advanced manufacturing methods. Depending on the type and rating, every G-E ballast receives from 7 to 10 tests during assembly.

Other low-maintenance features of G-E ballasts include:

1. Heat-resistant, AF cable used in all ratings up to 100 watts.
2. Capacitors used in G-E high-power-factor ballasts are filled with Pyranol—famous G-E liquid dielectric that will not burn.
3. Housings are die-made for strength and uniformity.

G-E ballasts are available for the complete range of MAZDA F lamps, 4 to 100 watts, inclusive. All G-E ballasts are listed by the Underwriters' Laboratories, Inc. All G-E Tulamp high-power-factor ballasts are certified by the Electrical Testing Laboratories. General Electric, Schenectady, N. Y.



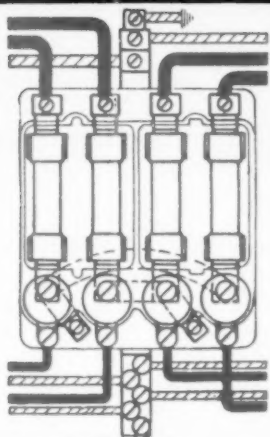
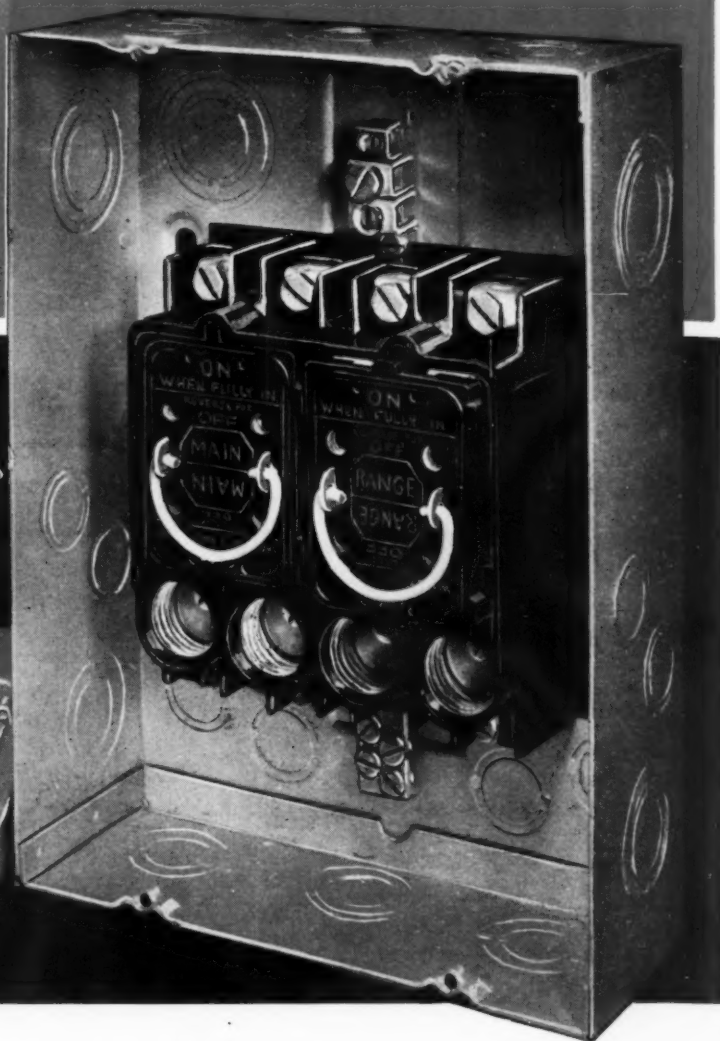
**EXTRA ASSURANCE
OF HIGH QUALITY
IN G-E BALLASTS**

GENERAL ELECTRIC

4118-3-5286

Take a
PEEP
inside!

THAT
KNUCKLEROOM
is characteristic
of all MURRAY SWITCHES



You see —
Murray

SWITCHES are easy and quick to wire. In wide variety, for indoor and outdoor use, they save installation time and give you generous profits. There are Murray jobbers from Coast to Coast. Metropolitan Device Corporation, Brooklyn, New York.

Catalog No. 52-4 (Outdoor) Combination main and range switch, 4 branch circuits. Shown above—Catalog No. 74-4, indoor type. Wiring diagram applies to both switches.

**TWO TO SEVEN FEWER
PARTS PER POLE MEAN**

fewer
time outs

**FOR WESTINGHOUSE TYPE A
SAFETY SWITCHES**

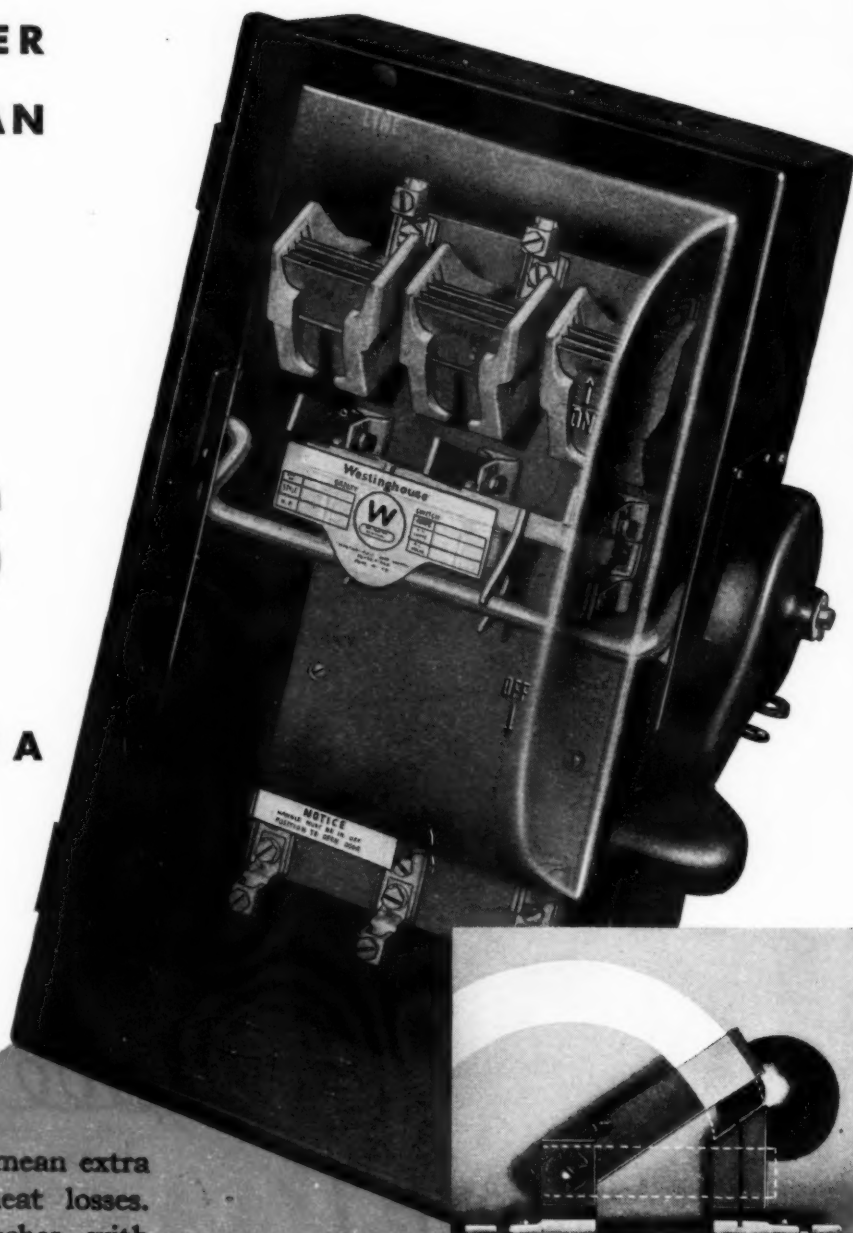


ONLY FOUR JOINTS PER POLE

Extra joints in current-carrying parts mean extra chances for loose connections and heat losses. That's why Westinghouse Safety Switches, with 2 to 7 **FEWER** joints per pole, save power... take less time out for maintenance and adjustments.

Westinghouse Switches stay on the job with less attention for two other reasons, too. One is the famous diamond-pointed jaw, which carries the arcing outside and beyond the contact area. The other is "De-ion" arc quenching action, provided on all 575 and 600-volt switches. No other switch offers these safeguards.

Give important production circuits this added protection. Call your nearest Westinghouse Agent for prompt service! Westinghouse Electric & Manufacturing Company, East Pittsburgh, Pa.



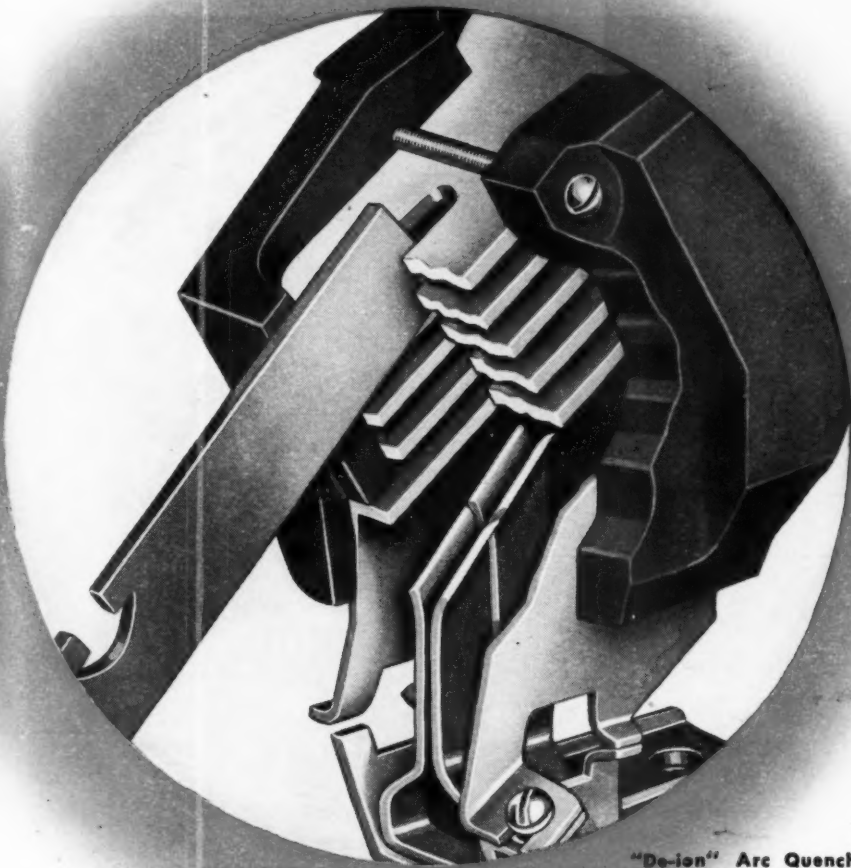
ARCING STAYS OUTSIDE CONTACT AREAS
—Blade extends beyond break jaw, which is diamond pointed. Arcing thus occurs outside contact areas, assuring clean contacts at all times.



OPERATING MECHANISM OUTSIDE CABINET, away from wiring. This feature leaves more wiring space, prevents possibility of mechanism chafing against insulation or short circuiting.

Westinghouse

SWITCHES FOR EVERY INDUSTRIAL APPLICATION



"De-ion" Arc Quencher on Westinghouse 575-volt Safety Switch. Arc is drawn up into grids, divided and extinguished.

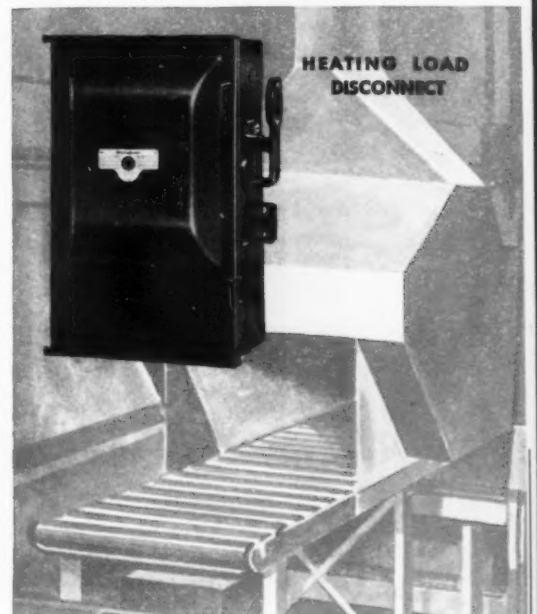
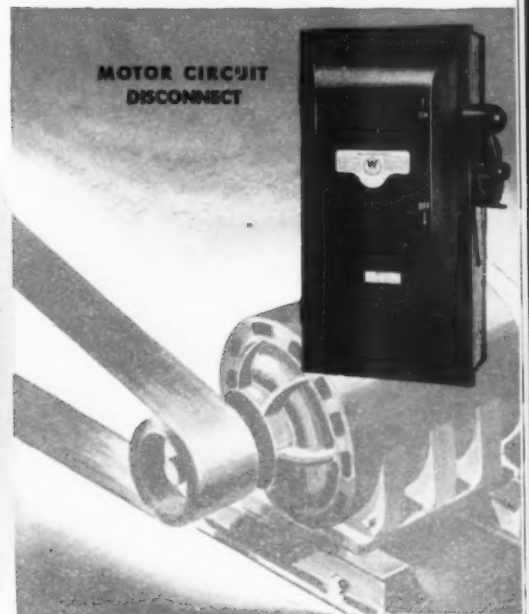
WESTINGHOUSE "DE-ION" PROTECTION FOR CONTACT POINTS GIVES

added protection

FOR VITAL CONTROL POINTS

"Keep 'em turning"—today's foremost requirement of production machinery drives—demands fully dependable protection for both motor and circuit. "De-ion" arc quenching action—an exclusive Westinghouse development—is added assurance that circuit protective and control devices will function with minimum attention. A feature of all Westinghouse across-the-line starters, circuit breakers and safety switches (575 and 600-volt ratings), "De-ion" quenching minimizes the effects of arcing, greatly lengthens the life of contacts, and reduces production delays for maintenance and inspection.

Don't take chances with essential circuits—call your Westinghouse Agent for prices and delivery on "De-ion" protected equipment. Westinghouse Electric & Manufacturing Company, East Pittsburgh, Pa. J-21184



e Motors and Control

Certify

...THE OPERATION OF
FLOODLIGHTING WITH
automatic control



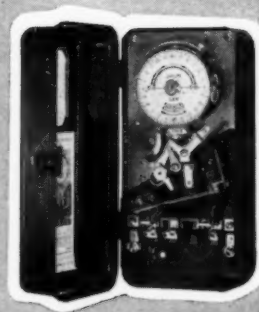
SANGAMO TIME-SWITCHES

★ When vital industrial property, such as storage yards, building approaches, railroad sidings, and transformer banks, is protected by floodlighting, there is one way to certify the operation of the lights, and that is with a Sangamo Time-Switch. This control eliminates the factor of human forgetfulness by operating the lighting automatically—which means dependably, punctually, and conveniently. Astronomic dial time-switches are ideal for floodlighting installations. Get Catalog 1000—it describes the complete line of Sangamo Time-Switches.



Form KAZ

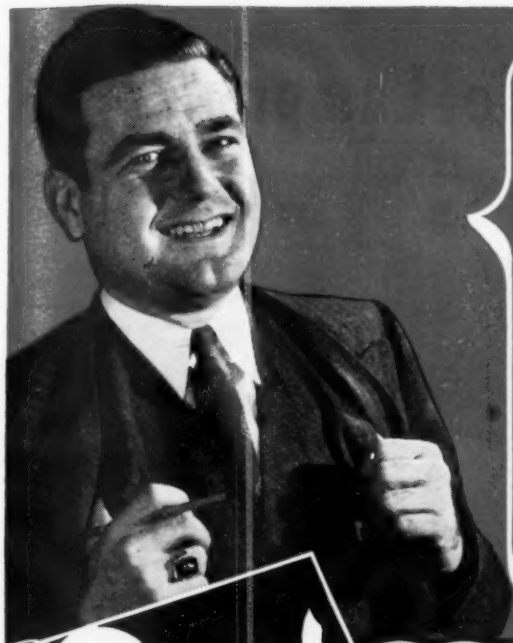
The setting of this KAZ astronomic dial time-switch changes automatically in accordance with sun-set and sun-rise. Also available in outdoor case.



Form VSWZ

The "on" and "off" settings of this VSWZ astronomic dial time-switch are not affected by current interruptions up to 10 hours. Can be had in outdoor case.

SANGAMO ELECTRIC COMPANY **SPRINGFIELD ILLINOIS**



**MR. CONTRACTOR—
You Can Make An
Extra \$1000 by Push-
ing GUTH Lighting—
Important for
Wartime Efficiency!**

Guth FLUORESCENT LIGHTING

Authentic National Figures Prove Profit Possibilities of Fixture Sales

EVEN with new building slowed down, you can still make some mighty nice profits by selling GUTH Fluorescent. Here's how the situation is:

1. Stores, offices, banks, etc., all want and need good Fluorescent Lighting. They've read about it, seen installations, and know its advantages.

2. GUTH Fluorescent is familiar to prospects because of our consistent National Advertising. And the quality features of GUTH Fixtures are easy to dem-

onstrate and sell.

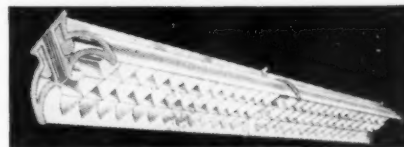
3. Actual figures show that the Average Contractor can readily sell enough GUTH Fixtures to net at least \$1000 extra profits a year! Larger-than-average Contractors, or any Contractor who puts extra effort behind GUTH Fixtures, will naturally make even more!

And that's the whole story in a nutshell. Surely it's well worth your going after, isn't it? Write today for helpful selling information.

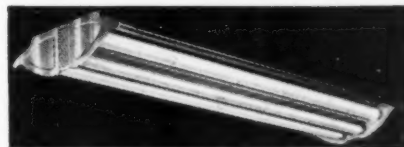
GUTH Fixtures Are Built for Modern Needs!



GUTH EXCELUX—Artistic designing plus scientific light output.



GUTH FUTURLITER — For Eye-to-the-Future Fluorescent planning.



GUTH TRUCOLITE — Engineered efficiency for greater economy and satisfaction.



THE EDWIN F. GUTH CO. • 2615 Washington Ave. • St. Louis, Mo.

Porcelain *Interchangeable* Lampholders



4 BIG REASONS

why you'll like these lampholders

We could tell you a lot about the quality and craftsmanship which goes into the manufacture of these versatile lampholders. But more important, to you who specify and install them, are these outstanding features:

- 1. INTERCHANGEABLE**—11 different caps and bases fit any of 5 different bodies.
- 2. GROUND SAFE**—The ideal socket for locations where there are exposed ground surfaces; such as in bathrooms, basements, breweries, and similar areas.
- 3. DURABLE**—The highly glazed porcelain surface is impervious to high temperatures and the corrosive action of moisture and fumes.
- 4. WIRING EASE**—Terminal screws are readily accessible. Two screws hold the body securely assembled to cap or base.

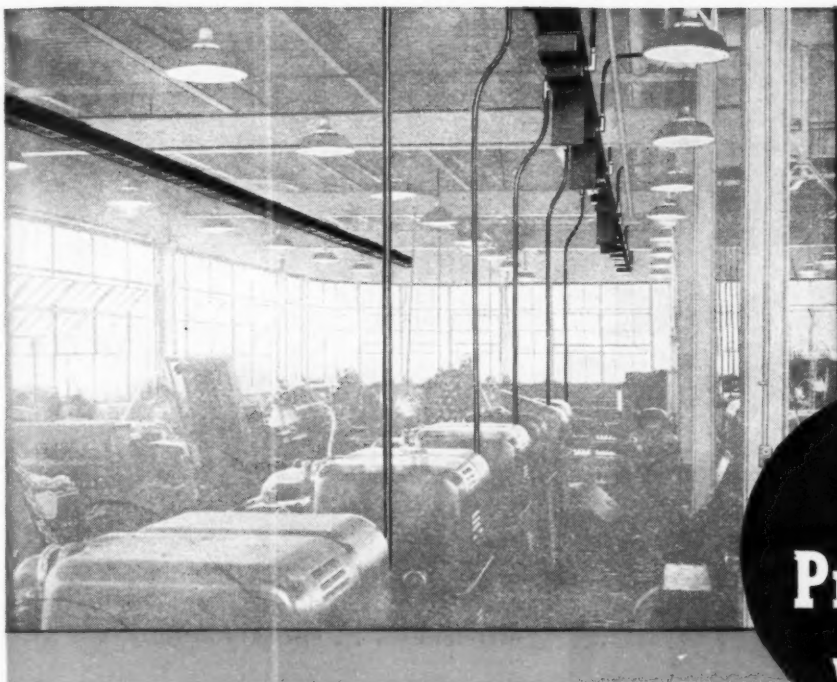


Catalog No. 40 pictures and gives specifications of the many different types of Bryant Lampholders and other dependable wiring devices. Be sure to get your copy. Write to the Bryant Electric Company, Bridgeport, Connecticut.

Sold Through Electrical Wholesalers Nationally



Every outlet deserves a Bryant device



This **FA** Busduct installation in a Michigan defense project shows how simple it is to place the machines, to plug in, and to start operation without delay.

Save Production Hours when moving machines

With **FA** Busduct for the distribution of power, it's a simple matter to "move the machine—plug in—go!" The easily accessible outlets of Plug-in **FA** Busduct, conveniently spaced, make it possible to move the machines to any desired location—to plug in quickly—and to resume operations with a minimum loss of productive time.

This is the Modern Way!

Compact and flexible, it is the convenient method for distribution of Electric Service . . . It is ideal when changes are necessary in machine layout. And it is economical from every standpoint, as installations in numerous plants have proved.

FA Busduct—both feeder and plugin types—are made in standard 10-foot sections. Each standard section of the Plugin type is arranged with nine plug-in outlets on 12-inch centers. (Other spacing optional.) Suitable elbows,

tees, cross-connections, expansion joints, transposition joints, end boxes, intermediate feed-in and feed-out boxes and reducing capacity sections, are supplied to fit required space or position—whether on wall or ceiling.

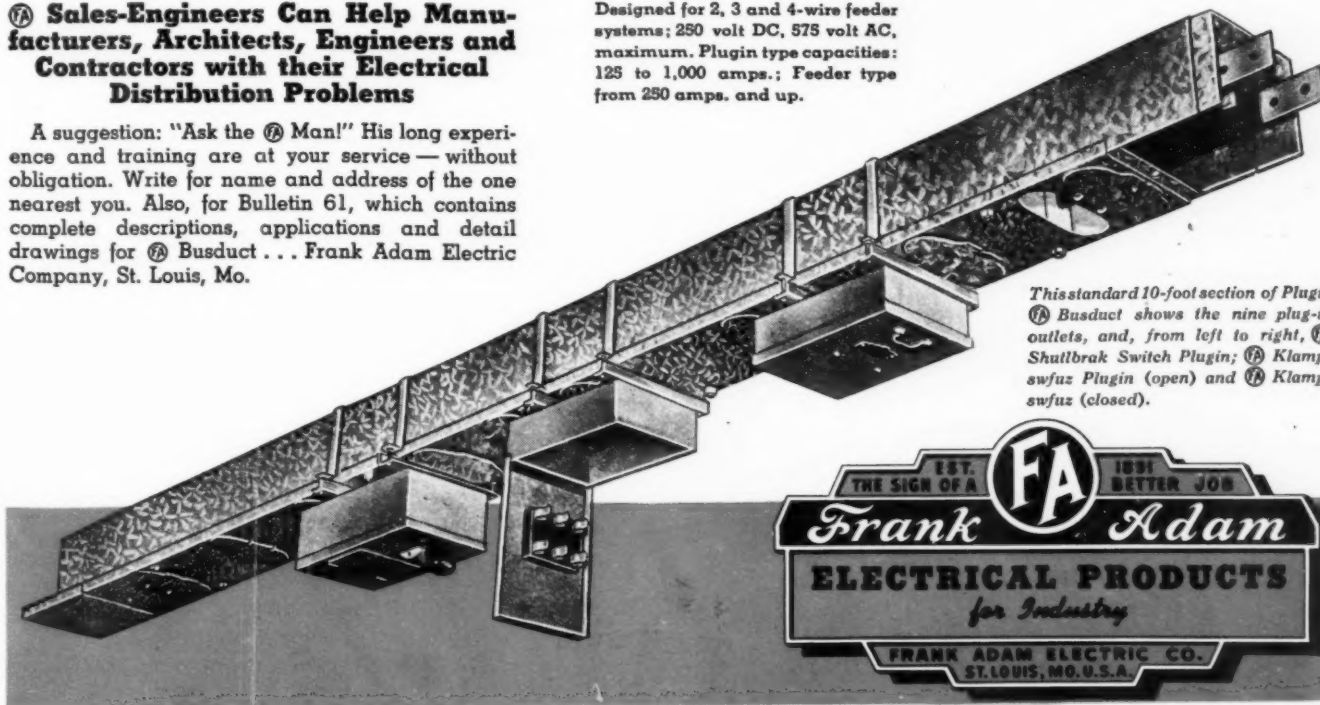
The copper busbars are contained in enclosures of steel or aluminum. They are rigidly supported at proper intervals by specially designed insulators that insure correct spacing—to meet the requirements of the National Electrical Code. Contact surfaces of connecting bars are silver-plated, to insure low resistance joints. This is further assured by specially engineered spring pressure bolts which hold the joints under even compression.

FA Busduct is practically immune to deterioration. It may be taken down and installed in new positions, in the same or different buildings, as need may require. Extensions may be made readily to existing installations. Moderate first cost is combined with low up-keep.

FA Sales-Engineers Can Help Manufacturers, Architects, Engineers and Contractors with their Electrical Distribution Problems

A suggestion: "Ask the **FA** Man!" His long experience and training are at your service—without obligation. Write for name and address of the one nearest you. Also, for Bulletin 61, which contains complete descriptions, applications and detail drawings for **FA** Busduct . . . Frank Adam Electric Company, St. Louis, Mo.

Designed for 2, 3 and 4-wire feeder systems; 250 volt DC, 575 volt AC, maximum. Plugin type capacities: 125 to 1,000 amps.; Feeder type from 250 amps. and up.



This standard 10-foot section of Plugin **FA** Busduct shows the nine plug-in outlets, and, from left to right, **(B)** Skidbrak Switch Plug-in; **(C)** Klamp-swifuz Plug-in (open) and **(D)** Klamp-swifuz (closed).

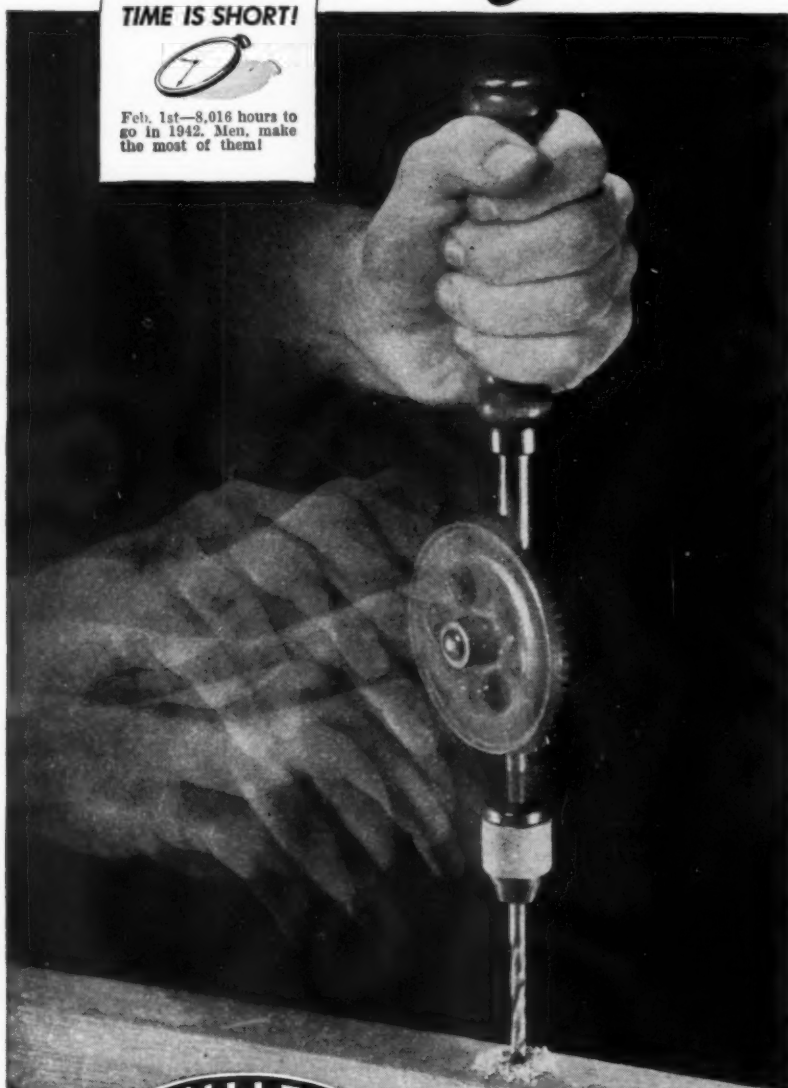


What you can do to help busy hands work *faster!*

TIME IS SHORT!



Feb. 1st—8,016 hours to go in 1942. Men, make the most of them!



MILLER

**50 FOOT CANDLER
100 FOOT CANDLER
MILLER TROFFERS**

Continuous Wireway Fluorescent
Lighting Systems

A MILLER Continuous Wireway Fluorescent Lighting System in your customers' plants will minimize worker eye fatigue . . . increase production efficiency . . . speed war effort.

Here's a *proven* way to help your customers' employees work better, faster, more surely and with less eye fatigue. Recommend MILLER 50 FOOT CANDLER or 100 FOOT CANDLER for factory areas and MILLER TROFFERS in offices and drafting rooms—for 50 foot candles or better of working light.

Obviously, by helping them, you help America's homefront battle of production . . . and *you help yourself.*

Today's conditions demand greater initiative than ever from qualified contractors, both in the promotion of adequate lighting and in its speedy, economical installation. The MILLER Continuous Wireway Fluorescent Lighting System can help you on both counts. Write for full details today. (Representatives in principal cities.)

**Be sure your customers get these
5 MILLER fluorescent lighting benefits**

HIGHER ILLUMINATION . . . 50 to 100 foot candles—with uniform light distribution.

30 TO 50% LOWER INSTALLATION COSTS . . . Make war production dollars go further.

FASTER INSTALLATION . . . Steps up building schedules—plants get into production quicker.

SIMPLIFIED MAINTENANCE . . . Easy-to-clean, removable porcelain-enamel reflectors—save man-hours for production.

ALLOWANCE FOR FUTURE LIGHTING NEEDS . . . illumination can be increased 45% without new fixtures—lower obsolescence.

*Multiflash photograph
made especially for
this advertisement by
Paul Wing*



**THE MILLER COMPANY
MERIDEN, CONN.**

Pioneers in Good Lighting Since 1844

• **MILLER offers a complete line of
filament and fluorescent lighting equipment**

Look Beyond the TRADE-MARK ...Look at the MOTOR!



Copperspun
Patented

YES, we are proud of the F-M trade-mark. But we are far more proud of the kind of motor on which that trade-mark appears. We know, and you know, that it's the motor and not the trade-mark that runs machinery.

That's why we ask you, when buying, to look beyond the trade-mark—*look at the motor.*

Look at the construction of a Fairbanks-Morse Motor point by point. Compare the Copperspun Rotor with any other type of rotor. Then ask yourself whether you want windings centrifugally cast of *COPPER* or of some less suitable material.

We believe that you know motor quality when you see it. That's why we ask you to look at the MOTOR. A post card or telephone call will bring you a demonstration. Fairbanks, Morse & Co., Dept. B25; 600 S. Michigan Ave., Chicago. Branches and service stations throughout United States and Canada.

FAIRBANKS · MORSE  MOTORS

DIESEL ENGINES ELECTRICAL MACHINERY MAGNETOS RAILROAD EQUIPMENT WASHERS-IRONERS
STOKERS PUMPS MOTORS WATER SYSTEMS FARM EQUIPMENT AIR CONDITIONERS

Controlled by a . . .

COLT MAGNETIC STARTER



Designed and built to help maintain today's 24-hour industrial activity . . .

- ▷ Straight line vertical operation.
- ▷ 3-point ball bearing armature guides.
- ▷ Double break pure silver contacts.
- ▷ Non-carbonizing molded contact block.
- ▷ Thermal overload relays with instant choice of hand or automatic resetting.
- ▷ Available in many forms—with local, remote, and transfer switch control.

Illustrated is a Colt Magnetic Starter and a Colt Push Button Station.

COLT'S PATENT FIRE ARMS MFG. COMPANY
ELECTRICAL DIVISION
106th YEAR OF PRECISION MANUFACTURING
HARTFORD, CONN.

TODAY—4 Ways to Get Helpful Information FAST...



1 YOUR HAZARD REPRESENTATIVE . . . this long experienced electrical expert lives near you, call on him for help (without obligation) any time you want it . . . on any type of job.



2 HAZARD BOOKLETS—BULLETINS—CATALOGS . . . are all crammed with facts, diagrams, pictures, code requirements—real help in making sure you're getting the right wire for every job. Write us for any you want. 1942 Electrical Buyers Reference also carries helpful facts on HAZARD Wires and Cables on pages 103-106.



3 YOUR OWN SUPPLY HOUSE . . . they are always ready to furnish specifications, prices or any information possible that will assist you in making every job successful.



4 YOUR HAZARD DISTRICT OFFICE . . . write, telephone or telegraph the nearest following office. It is there to assist you in any way possible.

Atlanta, Ga.	1606 Rhodes-Haverty Bldg.
Birmingham, Ala.	1520 Comer Bldg.
Boston, Mass.	1100 Statler Office Bldg.
Buffalo, N. Y.	44 Victoria Blvd., Kenmore
Chicago, Ill.	20 No. Wacker Drive
Cleveland, Ohio	316 Cleveland Railway Bldg.
Dallas, Texas	P. O. Box 694
Detroit, Mich.	1709 Ford Bldg.
Los Angeles, Calif.	2450 Hunter St.
New York, N. Y.	501 Fifth Avenue
Philadelphia, Pa.	Broad Street Station Bldg.
Pittsburgh, Pa.	1317 Gulf Bldg.
San Francisco, Calif.	1662 Russ Bldg.
Seattle, Wash.	801 Northern Life Tower
St. Louis, Mo.	1410 Shell Bldg.
Washington, D. C.	547 Munsey Bldg.
Wilkes-Barre, Pa.	72 Hazel St.

on HAZARD Insulated Wires and Cables



WITH THE DAILY SCENE CHANGING so rapidly because of war, you will find it . . . more than ever, . . . worth your while to check the above sources of information and news when planning a job. Although our factory is running day and night, you can be sure of immediate, careful attention. All of HAZARD'S forty years experience, plus the resources of a modern research laboratory and trained technical engineers are completely available to you.

HAZARD INSULATED WIRE WORKS

DIVISION OF THE OKONITE COMPANY

Wilkes-Barre, Pa.

Offices in Principal Cities

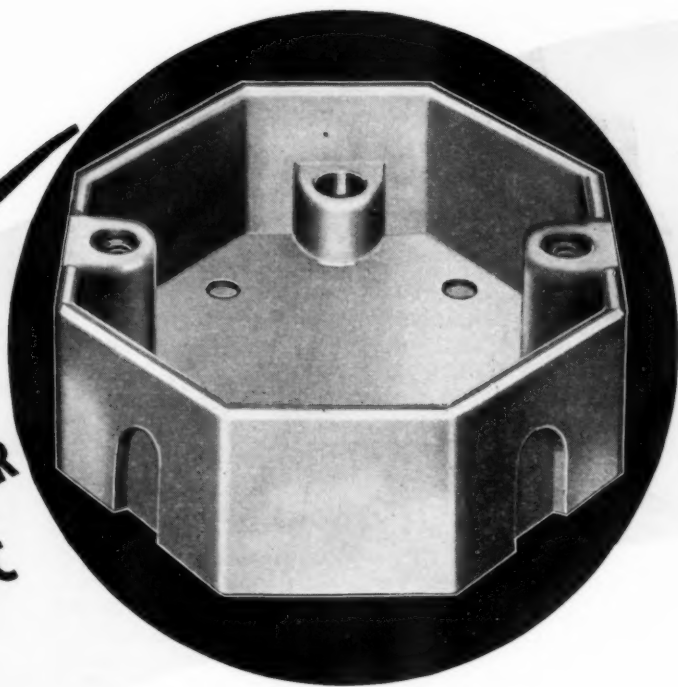


HAZARD

INSULATED WIRES AND CABLES

Save

* 74,000 TONS OF STEEL
1,400 TONS OF RUBBER
600 TONS OF ZINC



This large tonnage of defense materials would be available for the War Effort if Porcelain Protected Non-Metallic Wiring Methods were used.

BULLETIN

Defense Production aided through Electrical Industry's use of All-Porcelain Boxes. Action releases vital metals for defense needs.

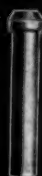
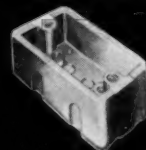
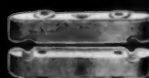
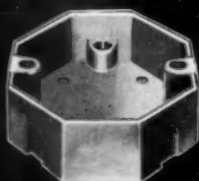
The responsibility of the Electrical Industry and its urgent need to cooperate in the War Effort is recognized by OPM, REA, FHA, QMC, and other Government agencies. To encourage a wider use of Porcelain Protected Wiring Systems, the Office of Production Management has listed these methods of wiring (Knob and Tube and Non-Metallic

Sheathed Cable) as the preferred methods for non-fireproof construction, while other Government agencies have made recommendations of their own to effect conservation of vital materials. Porcelain Protected Wiring Systems require the least amount of critical materials and conserve the greatest amount of steel, zinc, copper, and rubber.

Estimated figures from Edison Electric Institute

Materials for Modern Porcelain Protected Wiring Systems—Porcelain Knobs, Tubes, Cleats, Outlet Boxes, Switch Boxes, and Covers may be obtained through your wholesaler and are manufactured by

MODERN PORCELAIN PROTECTED WIRING SYSTEMS



★ ILLINOIS ELECTRIC PORCELAIN CO.
Macomb, Ill.

★ KNOX PORCELAIN CORPORATION
Knoxville, Tennessee

★ PORCELAIN PRODUCTS, INCORPORATED
Findlay, Ohio

Electrical Contracting

With which is consolidated *The
Electrict and Electrical Record*
Established 1901

W. T. STUART Managing Editor
ALICE McMULLEN Associate Editor
AUGUST ECKEL Middle West Editor
W. A. CYR Pacific Coast Editor
HARRY PHILLIPS Art Editor

W. K. BEARD, JR.
Publisher

M. S. MacNAUGHT
Manager



A SERVICE PAPER for electrical contractors, engineers, motor shops, industrial electricians and inspectors, covering engineering, installation, repairing, maintenance and management, in the field of electrical construction — industrial, commercial, and residential.

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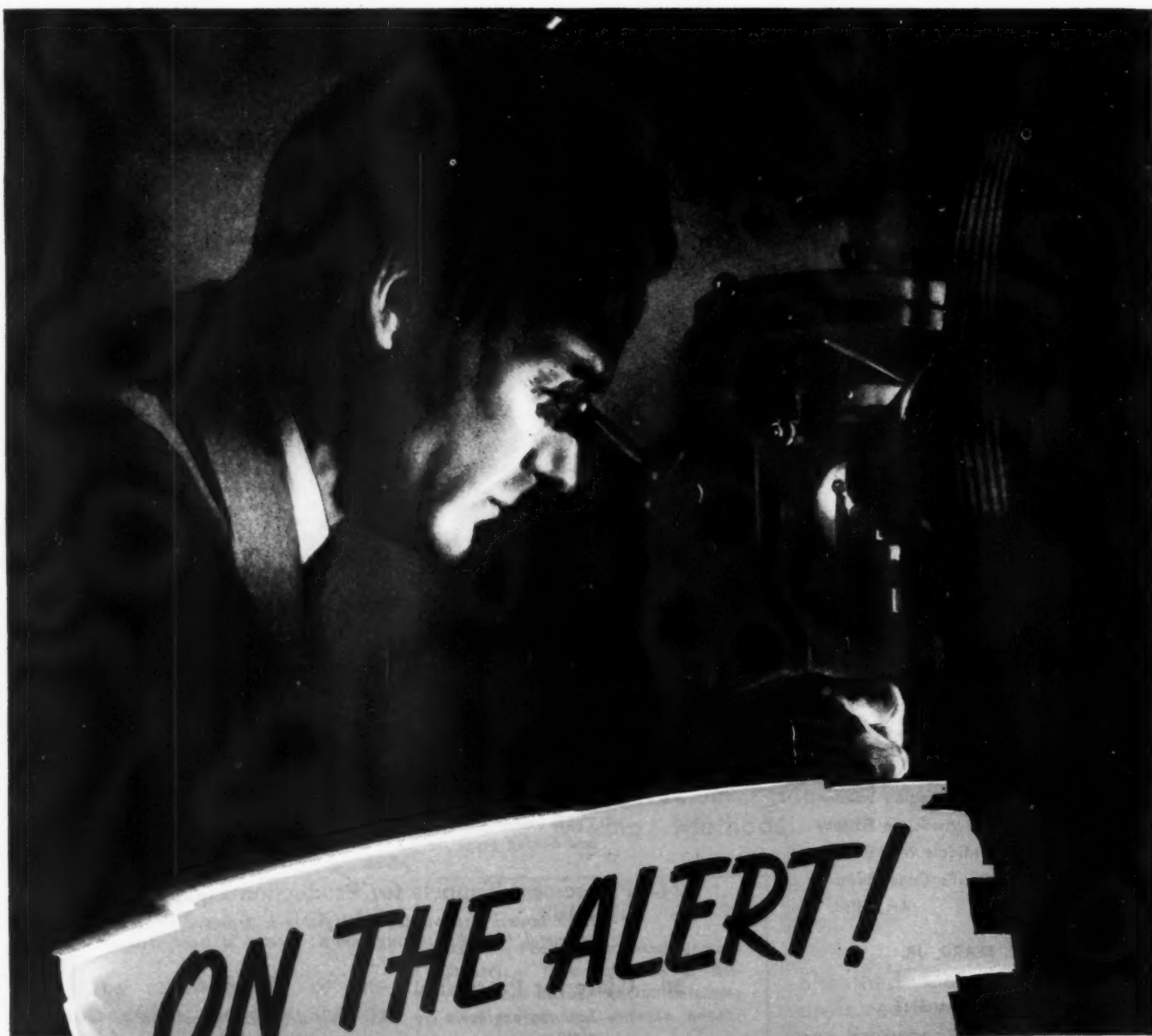
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JAMES H. McGRAW, Founder and Honorary Chairman

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ON THE ALERT!

There is no unguarded moment in Anaconda's "control" research; the war program and our industry can thus count on the uniform dependability in every Anaconda wire and cable.

K EEN-MINDED technicians peer intently into metallographic microscopes, day in and day out, watching, watching to see that flawless metals go into every Anaconda wire and cable that is delivered to war-vital work.

Unceasing control like this has earned its "keep". For, throughout industry and now in the army and the navy, users have learned they can lean heavily on the dependability of wires and cables bearing the Anaconda trade-mark. And that isn't all.

They have recognized Anaconda research as a source for many product improvements and for many completely new developments . . . such as Type CB* construction that outlasts ordinary shielded paper-lead cable three to one. This research is a boon to our war effort . . . it will be equally valuable to industry with the return of peace.

*CB—Trade-mark Reg. U. S. Pat. Off. 42242



This familiar trade-mark symbolizes the best efforts of modern research and production.

ELECTRICAL WIRES AND CABLES OF COPPER ARE THE LIFE LINES OF OUR NATION

ANACONDA WIRE & CABLE COMPANY

Subsidiary of Anaconda Copper Mining Company

GENERAL OFFICES: 25 Broadway, New York City • CHICAGO OFFICE: 20 North Wacker Drive • Sales Offices in Principal Cities

SURVEYS FOR CONVERSION

The great industrial conversion is on. From the automobile industry to the alley machine shop, tools and processes will serve the armed forces for the duration. But first an important electrical job must be done.

For years we have talked of overloaded feeders, of poor lighting, of voltage losses and of countless details indicating industrial inadequacy because of outgrown wiring. Comprehensive campaigns for system surveys have been proposed repeatedly as a sales tool for contractors and industrial service shops.

Though electrical men have persistently warned and cajoled indifferent management, the progress of electrical utilization is still far ahead of wiring modernization. And load expansion cannot go on indefinitely hooked up to obsolete wiring.

Those who heeded the warning are especially fortunate today. Their flexible, modern wiring is quickly adaptable to new plant processes and routine. Department shifts are minor problems. Their time and planning can be devoted to production.

Those industrial executives who saw only a pretty sales story in electrical modernization are in a tough spot now. They may have to accept wiring jobs trimmed to bare essentials. Flexibility and future capacity must be incidental to the main task of serving the load from our restricted stock pile. The urgent wiring needs for

conversion can be provided. The facilities for future industrial expansion, however, may have to be deferred.

Here the ingenuity of our industry can provide an important measure of extra value. Plant conversions are necessarily a quick job with the emphasis on serving new operations with the least possible use of scarce materials. But intelligent planning and foresight, from a background of practical wiring experience, can fit the immediate job into a comprehensive scheme for electrical modernization.

Skillful planning can project beyond the immediate needs of the job. Standards for apparatus and equipment can be established to allow interchangeability and minimum parts stocks. From the system survey, eventual requirements for flexibility and future loads can be set up. Power factor problems can be analyzed and corrective measures planned ahead. Then the immediate alteration job can be designed as a part of the whole project.

The wiring survey is no longer a promotional method. It would be impossible to provide today for all the needs it would disclose. But if the electrical alterations for plant conversion to war work are to be sound, practical and economical, a wiring system survey must be part of the job. So check with your industrial customers today. Make the surveys while new production plans are being drawn.



YOUR GraybaR MAN OFFERS HELPFUL FACTS ON ELECTRICAL EQUIPMENT PRIORITIES

Now that the availability and delivery time of so many electrical supplies is being determined by priority regulations, GRAYBAR is performing a new service for the benefit of its regular customers. We are making every effort to keep informed of the latest governmental procedures and interpretations which affect the delivery of the electrical equipment and supplies you need. And we are doing our best to see that these helpful facts are made available to you through your own local GRAYBAR Representative.

Naturally, GRAYBAR cannot change the "rules of the game", but we can help to overcome those difficulties and delays that result from confusion as to the procedure to be followed. In addition, GRAYBAR's thorough knowledge of electrical specifications for all types of defense work can often simplify and speed up other aspects of the job. At each of its 87 offices, coast-to-coast, GRAYBAR is out to give its customers the action-service that the times require.

GRAYBAR in over 80 principal cities



Executive Offices:
GRAYBAR BUILDING
NEW YORK

Saving Metals in Wiring

How to make the most of drastically limited supplies of scarce materials. A round-up of conservation methods.

FROM the beginning of the Defense Program to the outbreak of war, restrictions on scarce materials tightened progressively. Since Pearl Harbor the need for drastic conservation has been evident to everyone.

In electrical construction work some of the critical metals are essential and no suitable substitutes are available. For work under priority ratings, copper and other metals will continue to be available. But it is the immediate concern and responsibility of every industrial group to study its methods and practices to determine where savings can be made without impairing the essential functions of the work performed.

It is apparent that conservation of critical metals is distinct from the question of over-all price economy. Economy of scarce materials may, in fact, involve more expensive methods and design. A very critical study must be made of the work to be performed and a careful design created to make the most practical and effective use of the scarce metals.

Conservation may dictate the use of higher voltage distribution, substitute wiring systems or simply the elimination of portions of the future capacity provisions that would normally be installed. But it is always a comprehensive job, taking into account not only the metals saved but the effective utilization of the system remaining.

Higher Distribution Voltages

The use of higher distribution voltages offers an opportunity to double the capacity of existing power systems and

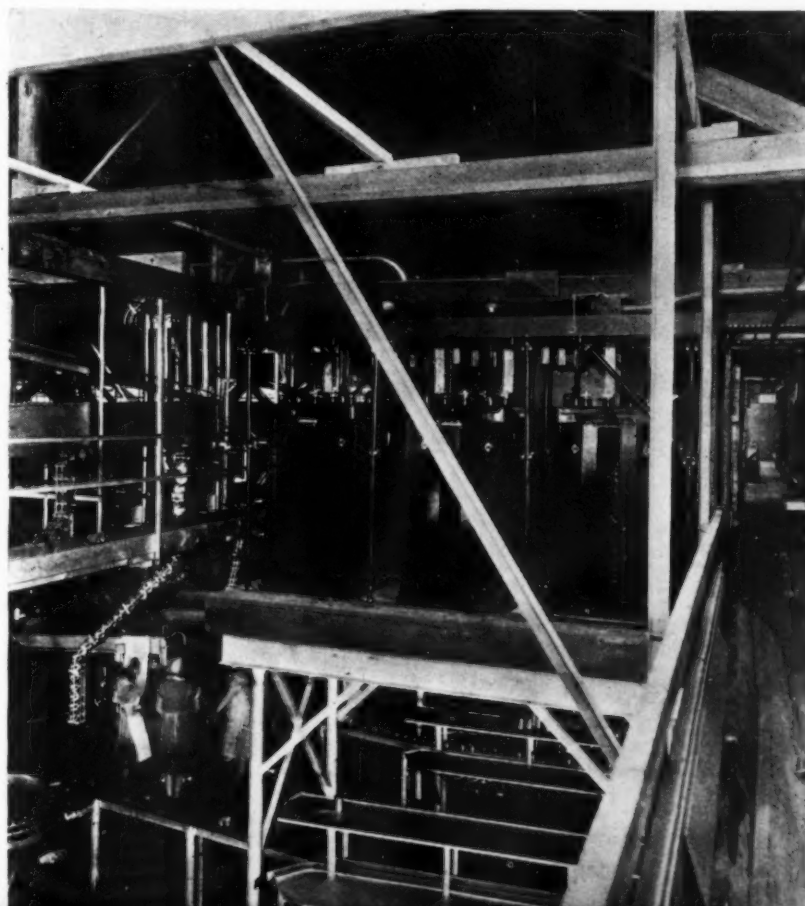
reduce the weight of copper required for new installations.

For new plant systems the distribution system may be designed for primary voltages and suitable load center distribution cubicles located at convenient points to hold secondary runs to a minimum. Primary distribution also reduces the amount of copper required for heavy secondary switchgear. Specially designed plant substations with fully protected, dead front, switchgear have been designed for installation without special protection in the production area.

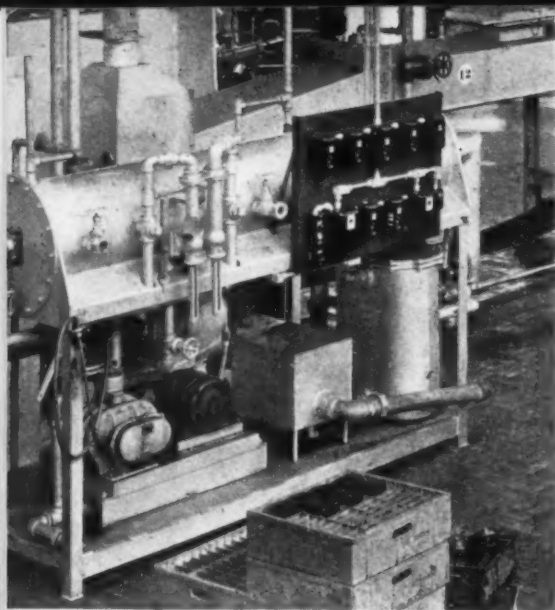
Conventional 208-volt network services may be replaced by a 440-volt, three-phase system with all power

equipment at service voltage and with lighting served by local insulating transformers tapped into the power system at convenient locations above the lighting panelboards. This system is proving very popular in the moderate sized industrial plant where power loads substantially exceed the lighting load.

Where existing factories are to be converted to war work, increased service voltages offer an opportunity to double the capacity of existing feeders. Many conventional polyphase motors are provided with connections for both 440 and 220 volts. In handling this type of project, a careful plant system survey is required to check the motors, controllers, panels and other equipment for

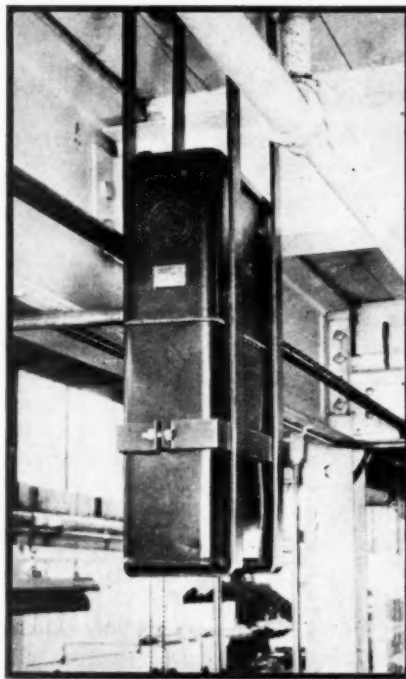


TRANSFORMER STATIONS near load centers allow short secondary feeders with minimum voltage loss. The units shown are 200 kva., 2400 volt, single phase.



CONVENIENT BUTTON CONTROL is economical in materials. Remote contactors can be installed in the direct motor-to-panel run.

CAPACITORS CORRECT low power factor and will allow full utilization of feeder capacity to save copper. A 15 kva., 440 volt unit suspended from the ceiling.



conversion to the higher voltage. Magnetic contactor coils must be changed, motor protective devices corrected and fuse clips altered. Individual motor feeders may often be converted into sub-feeders serving two or more machines or processes.

A single transformer installation can be installed to serve the lighting feeders. However, additional feeder capacity can be obtained by using local transformer at the panelboards and reconnecting existing 3-wire, single-phase feeders for 440-volt, 3-phase.

For new general lighting systems with fluorescent units, branch circuits can be reconnected from 2-wire, 110 volts, to 220 volts if appropriate ballasts are used. New panels with double pole circuits would be required. In using existing neutral conductors for a "hot" wire the white braid should be properly marked at each outlet with a distinctively colored paint.

Substantial savings in wire may be made by careful routing of motor branch circuits. Wherever possible, place the disconnect in a direct line

between the sub-feeder tap and the motor. For convenient operation use a magnetic contactor and extend the push button circuit to the point of most convenient control.

There is not much range for material substitution in electrical work. Our most restricted, yet most essential item is copper. But among the other materials which make up raceways and mechanical protection, there are opportunities to use substitutes for metals effectively and safely.

Where feeder conduits can be installed underground, fiber ducts, pump log and tile, with concrete handholes save on big pipe. For feeder runs high in building monitors, open wiring on porcelain cleats is an effective and metal-saving method.

For houses and other small buildings, non-metallic sheath cable or knob and tube wiring with porcelain boxes is an already popular and fully approved method of conserving metals. A porcelain type of entrance cutout is now

SECONDARY DISTRIBUTION involves heavy copper. This substation distribution cabinet is located close to the load, a primary circuit feeds the transformers. Long secondary runs are eliminated.



under development. Porcelain and plastic lampholders release much needed brass for other uses and many new types of lighting fixtures are using a minimum of metal parts.

Future Capacity

Electrical utilization is an expanding factor in industrial processing. To install systems which do not allow for future loads can be a serious false economy. However, effective future capacity can be designed into the job without actually installing the copper.

In this problem we can take a tip from the experience of contractors in rewiring commercial buildings for air conditioning and added lighting. The difficult and time consuming part of the job was in providing added raceway capacity. In many instances there were no accessible spaces for new branch conduits and feeder users.

So from the service entrance up, the following future capacity features use little material and can be provided on every job.

1. Space for additional entrance equipment.
2. Wiring gutters extended to future switch locations and of sufficient capacity for future feeders.
3. Space and convenient location for an added feeder distribution panel.
4. Hanger racks on inserts for future feeders.
5. Chases and sleeves for future feeder runs.
6. Pull boxes and space at future panel locations to allow convenient recircuiting of existing panels.

The best method of insuring available space and effectively linking the fixture capacity design with the existing system is to draw up a complete layout including the future runs. Then eliminate the major future items as required, step by step, but leave in at least the details of hangers, pull box sizes, equipment space, etc.

This plan is now being employed to good effect in adequate wiring promotion. Restrictions have cut into the number of outlets which may be installed but the adequate wiring contractor works with full A.W. job layout, carefully deleting the less essential outlets but making all the necessary provisions to permit their installation easily and inexpensively when the ban is lifted.

Effective conservation is not easy. There are many questions of price and future use that confuse the main issue. But skillful planning can give us good electrical work and save metals for war.

SWITCHING for ALERTS

Lighting control must be readily available for the blackout. Circuits and methods for emergency operation.

NO mainland cities are yet living under the London type of blackout regulations. Air raid precautions are, however, being established in every coastal city and many inland industrial centers. In order that air raids shall not succeed in one fundamental purpose, to interrupt production, the obscuration method of shutting off interior illumination is applied to essential production areas, some stores and in homes.

For most buildings, schools, stores, offices or other occupancies where interruption of normal lighting would have no serious effect on the war effort or civilian morale, the blackout problem is one of switching only. Facilities must be provided for extinguishing all visible lighting and for restoring normal light when the alert is over.

Operation of the main entrance switch is impractical—though almost

invariably proposed at local civil defense meetings. Many such switches are not suitable for opening under load. Emergency corridor lighting, essential power services and lighting in obscured portions of the building must be maintained. Further, closing a main line switch with a full connected load when the all clear is sounded may have serious consequences not only to the service equipment but the utility lines.

Switching plans for emergency operation may be divided into three separate projects for the electrical contractor.

1. Facilities for cutting off and restoring lights in large office buildings or stores from a central point.
2. Remote control of lights in out-buildings or surrounding structures not served through the building from which the lighting must be controlled.
3. Emergency switches for show windows, safety lights and other illumination on premises likely to be unoccupied when the warning sounds.

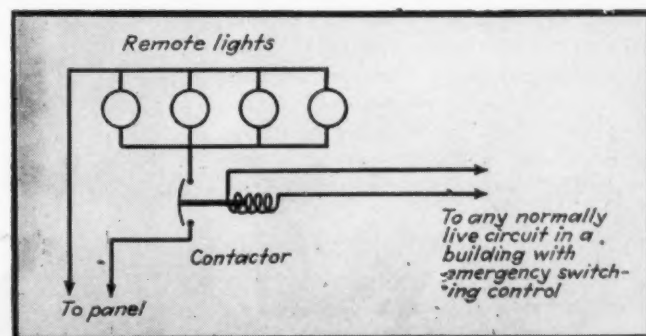
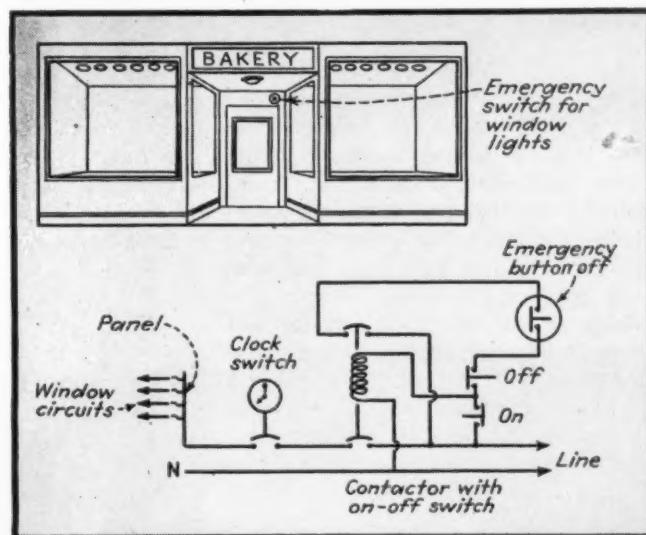
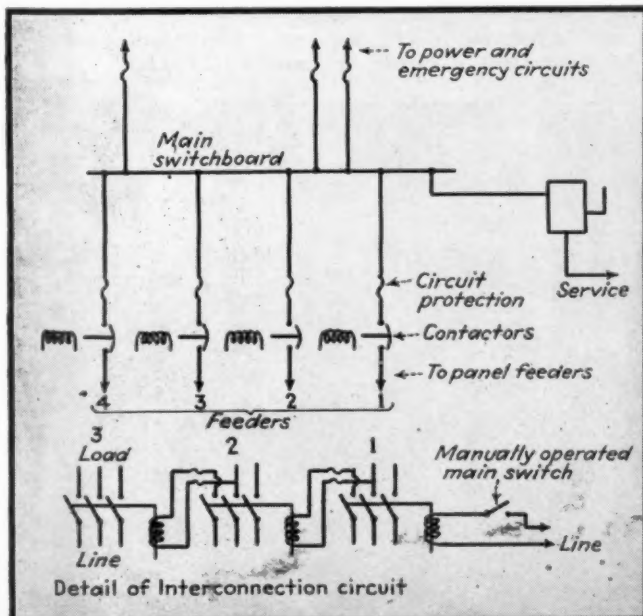
From British experience, the remote operated contactor is the most useful and practical device for controlling building lights. The contactors are

[Continued on Page 40]

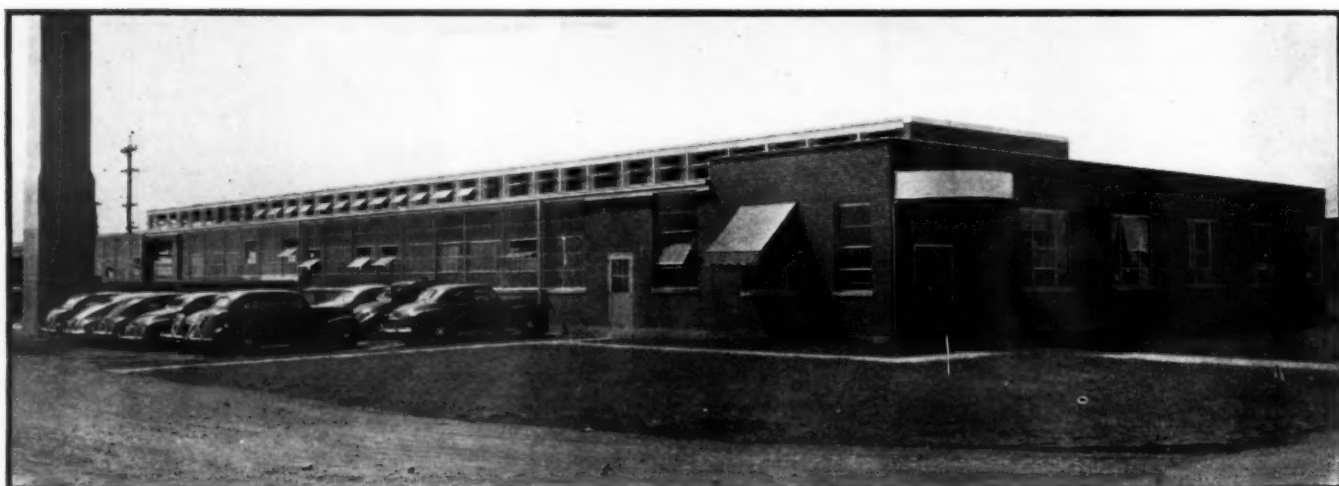
WINDOW LIGHTING cutoff button may be placed over door in the "off" circuit of the magnetic contactor. Lighting may be restored only from within the store. (Top right)

REMOTE LIGHTS may be controlled by extending the contactor coil leads to the nearest building under central switch control. (Lower right)

BUILDING CONTROL uses interlocked magnetic contactors. Opening main control drops out contactors in sequence. Closing sequence may be slowed down with time delay relays. (DIAGRAM 1)



Accessible Power for Speedy Changes



Wiring adaptability ready for war time schedules is provided by accessible entrance equipment, bus ducts, and good lighting. The new Illsco plant uses fluorescent light and busbar power distribution.

DETAILS mark the job. Whether on a small house wiring job or a war industries plant covering acres, good design, layout and workmanship are indicated in the accommodation for accessibility, flexibility and the actual use of the copper and steel that make up the wiring system. The wiring in the new manufacturing and office building of Illinois Copper Tube and Products Co., near Cincinnati, is typical of the work leading electrical contractors are doing to prevent sudden and wasteful obsolescence where war contracts may shift production schedules overnight.

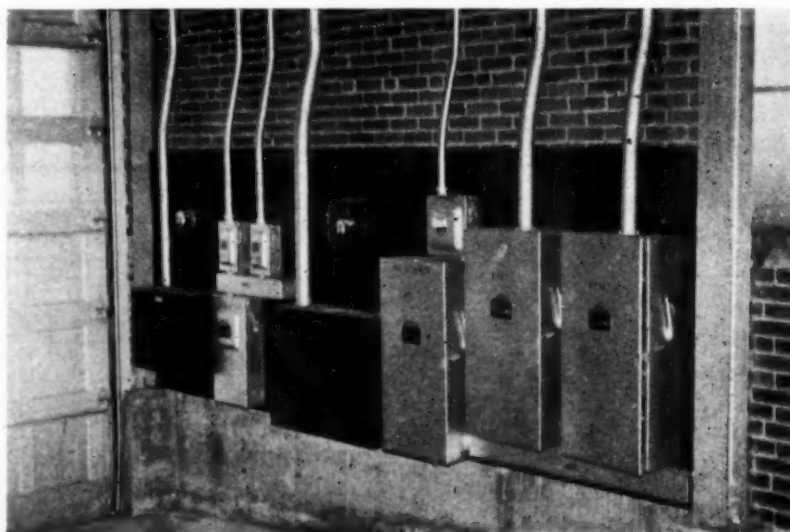
Bertke Electric Co. are the electrical contractors, Felsberg and Gillespie, the architects and Fosdick and Hilmer, the consulting engineers. The building is a modern one story monitor roof structure 90 by 240 feet with an adjoining boiler house. The front portion is finished in modern trim for general offices

with ceiling mounted fluorescent lighting. The manufacturing area is divided into three 30-foot bays, a high center bay with 25-foot ceiling and two side bays with 14-foot ceilings.

Electric services for light and power

enter from overhead lines to separate service cabinets arranged along the rear wall beside an entrance aisle. This location discourages any accumulation of materials in front of the entrance switches, as such an accumulation

SERVICE EQUIPMENT and distribution switches are located at entry aisle, conveniently arranged for maintenance, accessibility or emergency operation.



would also obstruct the passageway.

Lighting circuits are fed from 3/0 service and a 200 ampere main switch, divided into two 100 ampere sub-feeder circuits extending through the building along both sides of the high bay. Taps are stubbed down to fused cutouts and individual circuit breaker panelboards at convenient column locations.

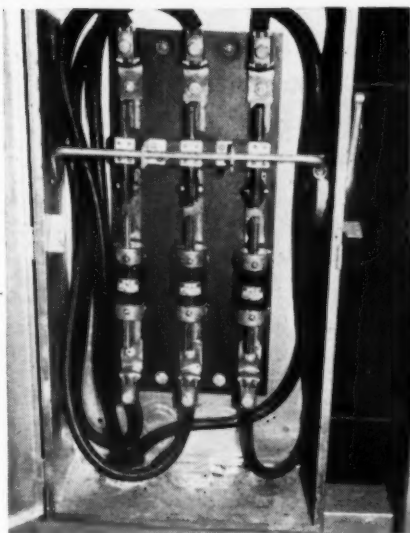
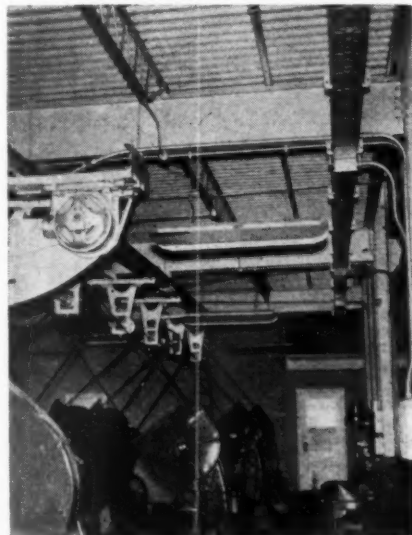
In each of the low bays, two tube fluorescent industrial lighting units are installed in three rows on 8-foot centers. The center bay is equipped with 10 400-watt high intensity mercury vapor lamps in narrow angle reflectors suspended on conduit stems high enough to clear the crane.

Power circuits are fed from a 3-phase, 240-volt, 3-wire, 500,000 cm. service through subfeeder switches. A separate circuit of three No. 6's extends to the crane trolley. Power feeders extend to two lines of enclosed busbars with plug-in type circuit connectors.

At each machine location, a fused disconnecting tap is installed on the duct and a separate branch circuit dropped down to the motor controller. The system permits ready access to the bus for new taps or for relocating existing machines as production changes require.

Although the job was designed to be thoroughly practical from all angles, including cost, for existing production needs, the combination of good lighting and accessible power accommodations provides for speedy changes without waste. It conserves both existing system capacity and new materials for any revised production schedules that the war may call for.

CEILING MOUNTED motors are wired to a controller mounted at the column in the usual way. Branch circuit from bus drops to controller and then back to the motor location.

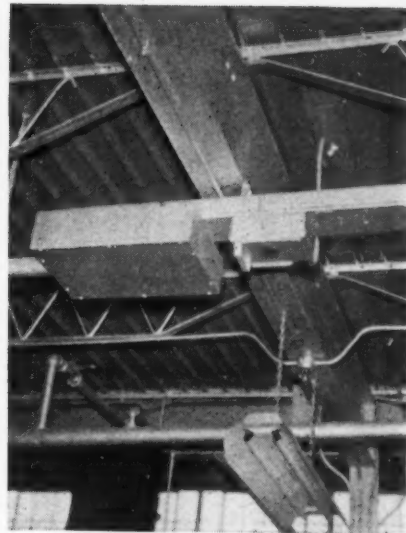
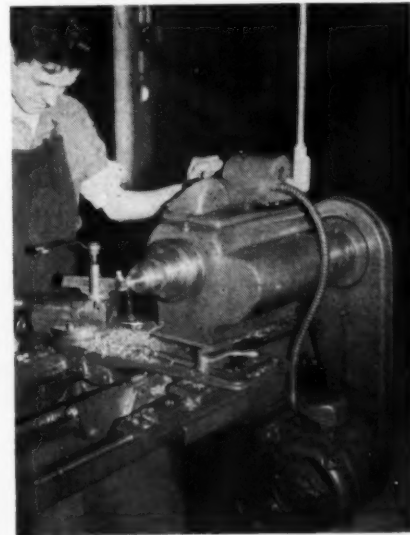


CLAMP TYPE solderless lugs on all feeder connections insure full capacity without heating and allow quick changes for emergency hook-ups.

CIRCUIT CONNECTIONS are made with disconnecting cutouts mounted on the bus enclosure, conduit and wire are extended to conveniently located controller.

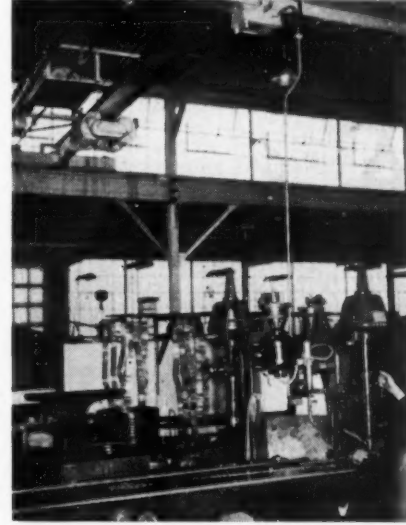


OVERHEAD FEED enters at the control switch with a simple fitting. Branch circuits are routed on the ceiling so that the drop falls at exact location to avoid unnecessary wiring around machines.



JUNCTION BOXES enclose connections from power feeders to bus terminals. Two lines run the full length of the production area for power supply to machines.

SELF-SUPPORTING VERTICAL runs are short and out of the way. Equipment may be changed or relocated with no feeder changes and a minimum of branch circuit work.



LIGHTING CONTROL points are Multi-breaker panels protected by fused cutouts in the feeder taps. High intensity mercury vapor lighting is installed in the crane bay, two-lamp fluorescent fixtures in side bays.



INFRA-RED DESIGN

By Dean M. Warren

General Electric Lamp Department
Nela Park, Cleveland, Ohio

Infra-red heating and drying can play an important part in stepping up production in our war industries. Use these charts to aid in calculating lamp loads for heating, drying and baking.

AMERICA'S war program has challenged industry to do one of the greatest jobs in its history—that of producing gigantic quantities of military materiel in record time. Industry has accepted and is turning all its engineering genius to the problem of increasing production. No time saving possibility is being overlooked.

One of time's most effective allies in the race for peak production is the application of infra-red lamps to all types of industrial heating, drying and baking processes. The job that the equipment can do in opening up production bottlenecks has been proved

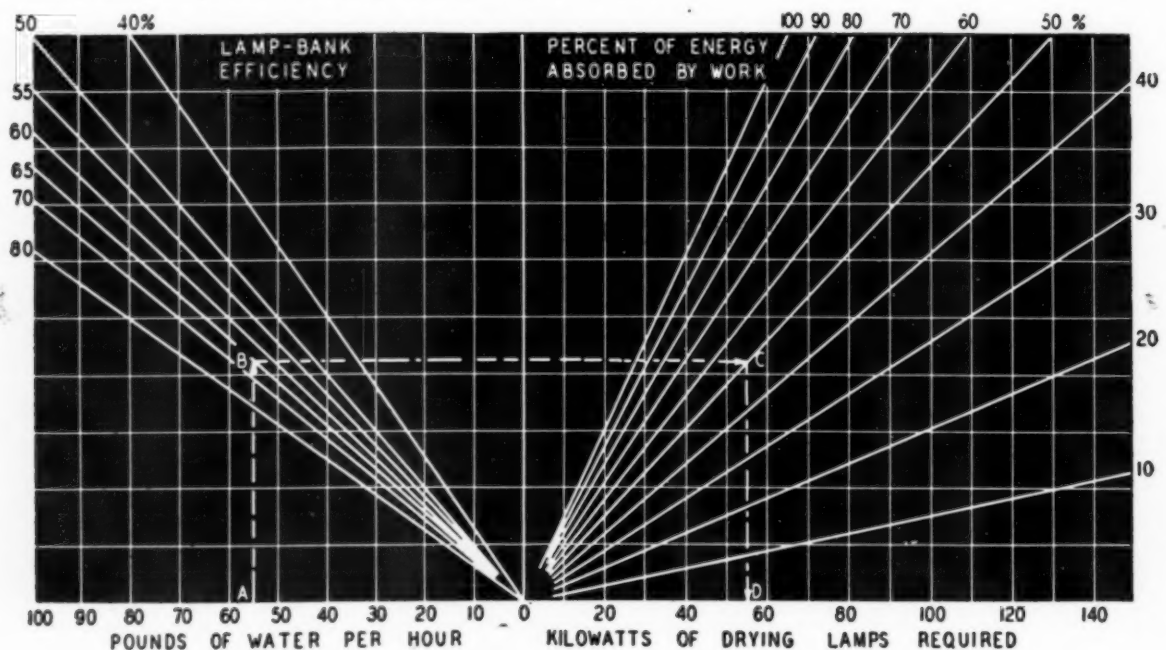
through research and actual installation tests and data. Industry has discovered that infra-red equipment:

1. *Saves Time*—in operation and construction. Process time is drastically reduced and installation time is short.
2. *Saves Space*—less floor space is required and in many cases the tunnels can be suspended from the ceiling.
3. *Saves Power*—overall power loads are reduced since no warm-up period is necessary. Ovens can be used only when needed and can be photo-electrically controlled.
4. *Flexible Tunnels*—can be made portable or easily enlarged or changed to fit any product or process.
5. *Easily Adaptable*—equipment can be arranged to conform to straight line production requirements.
6. *Maintenance Ease*—lamps can be easily replaced and reflectors easily cleaned. Lamps are easy to stock.
7. *Improves Working Conditions*—areas immediately surrounding infra-red equipment are not uncomfortably hot.
8. *Lower Investment*—the original capital investment in equipment is less than that for conventional heating apparatus.

Now we know the advantages infra-red equipment offers. But how can we determine the number of lamps to use

CHART 1. WATER HEATING AND EVAPORATING—Approximate kilowatts of drying lamps for this operation can be determined by following the chart in a clockwise direction. Example: Problem—Find kilowatts of lamps needed to heat 55 pounds of water per hour, with an absorption of 50 percent and a lamp bank efficiency of

65 percent. Solution—Start at "A" (55 lb./hr.); go vertically to "B" (65% efficiency); then horizontally to "C" (50% absorption); then vertically downward to "D" (55 kilowatts). The value at D is the answer. This chart is based on an initial water temperature of 70 deg. Fahrenheit.



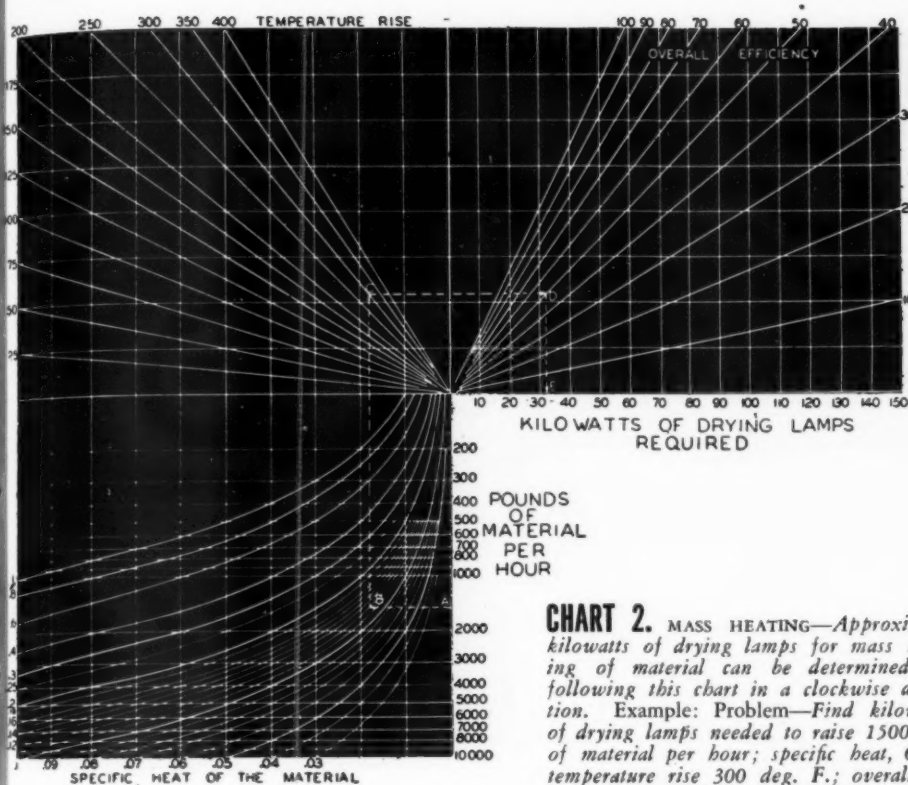


CHART 2. MASS HEATING—Approximate kilowatts of drying lamps for mass heating of material can be determined by following this chart in a clockwise direction. Example: Problem—Find kilowatts of drying lamps needed to raise 1500 lbs. of material per hour; specific heat, 0.12; temperature rise 300 deg. F.; overall efficiency of lamp bank and work, 50 percent. Solution—Start at "A" (1500 lb./hr.) go horizontally to left to "B" (Specific heat, .12); then vertically to "C" (300 deg. F. temp. rise); then horizontally to right to "D" (overall lamp and work efficiency, 50 percent); then horizontally down-

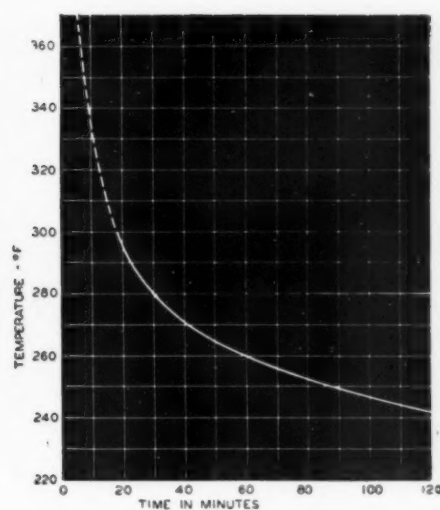


CHART 3. PAINT BAKING TIME—This curve shows the baking time required for typical paint at various temperatures. Caution must be used in increasing temperatures on paint films, since not all paints will stand a substantial increase above their designed baking temperature. Most organic pigments tend to fade at elevated temperature. Consult a paint chemist when considering a radiant energy installation for paint baking.

ward to "E" (33 kilowatts). This is the answer—33 kilowatts of drying lamps to do the job.

for any particular job? How much power is going to be needed? The problem can be quickly solved by referring to a few simple charts developed by Howard Haynes, General Electric lamp department, who has done considerable research work in this field. The charts illustrated cover the following:

Chart 1—Water heating and evaporating.

Chart 2—Mass material heating.

Chart 3—Baking time for typical paint.

Chart 4—Radiant energy for paint baking.

An explanation and example of how to use the chart is given under each graph. By using this graphic method a proposed installation can be readily determined through calculation. However, since materials, conditions and requirements vary considerably, it might be well to check the calculations by following through with tests.

We all know the part that time will play in winning this war. We must do all we can to expedite production. Infra-red heating is proving itself a great time saver in production. It is a field that the electrical contractor and plant electrical man cannot ignore. They are in key positions and should offer helpful suggestions and problems in their field. And infra-red is one suggestion that may break that production bottleneck.

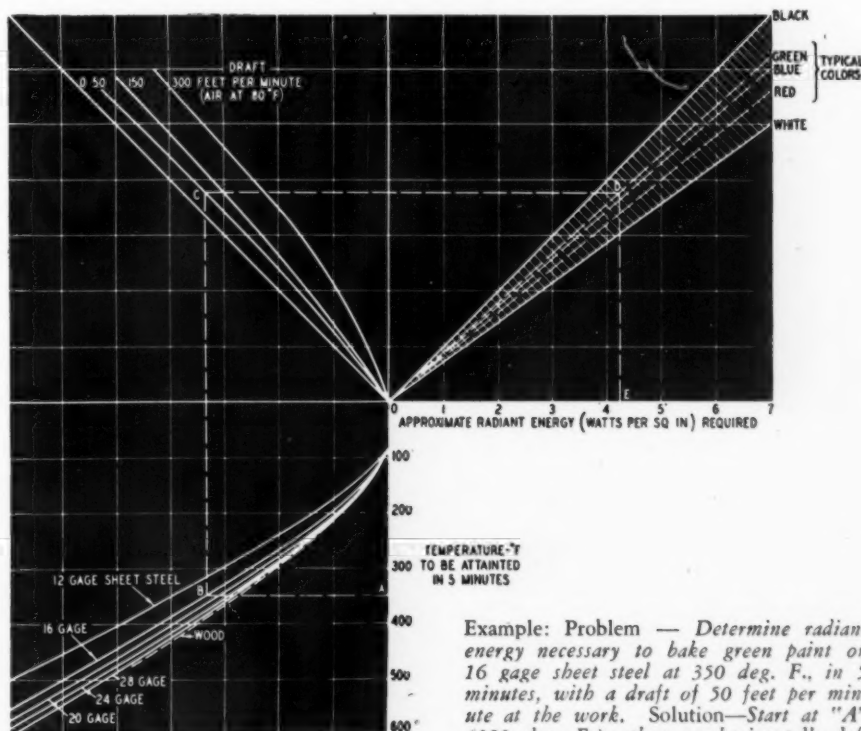
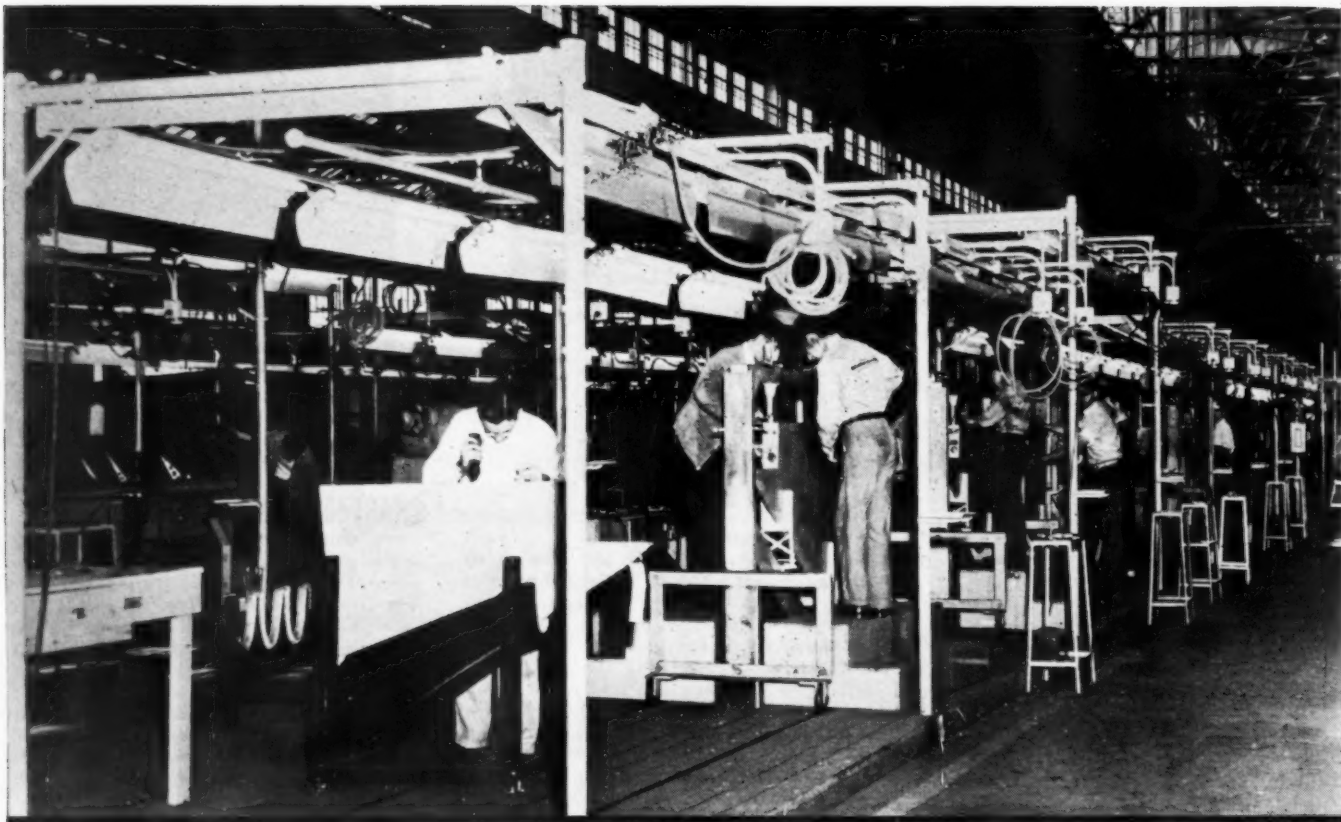


CHART 4. PAINT BAKING ENERGY—Approximate radiant energy necessary for paint baking can be determined by following this chart in a clockwise direction.

Example: Problem — Determine radiant energy necessary to bake green paint on 16 gage sheet steel at 350 deg. F., in 5 minutes, with a draft of 50 feet per minute at the work. Solution—Start at "A" (350 deg. F.); then go horizontally left to "B" (16 gage sheet steel); then vertically upward to "C" (50 ft./min. draft); then horizontally to right to "D" (green color); then vertically downward to "E" (4.2 watts/sq. in.) This is the answer—4.2 watts of radiant energy per square inch of material.



FLUORESCENT TUNNELS

High intensity supplementary lighting is provided for line production on metal parts by lighting tunnels located at work stations.

SPEEDY changeover for precision work is usually accompanied by a lighting problem. In new plants with lighting designed for 50 foot-candle general illumination and upwards, operations involving critical seeing tasks can be moved around the plant with little regard for the lighting system. But conventional manufacturing plants a few years old are rarely equipped with adequate general light for the kind of work demanded of industry in these times.

Relighting the whole plant area with modern illumination equipment to provide the necessary lighting level is the obvious solution but one which is not always practical under existing shortages of critical materials. For the production line type of manufacturing oper-

ation, however, there is an excellent solution in a supplementary lighting canopy pioneered at Fleetwings, manufacturers of aircraft parts. The lighting system is a part of a development which has already increased output several times and is applicable to many types of production line manufacturing in converted plants.

Along assembly lines, through which assembled frames flow for the attachment of parts, a metal frame supporting fluorescent fixtures forms a tunnel-like structure providing high levels of illumination at each working station.

The illumination problems are severe as the work at each station involves many precise operations. In general, small sub-assembly parts are fed to the final assembly lines where they are

placed in adjacent racks. The preliminary frame is placed in a portable jig and to this the various parts are added. Workmen at each station perform special operations such as welding, drilling, dimpling and riveting.

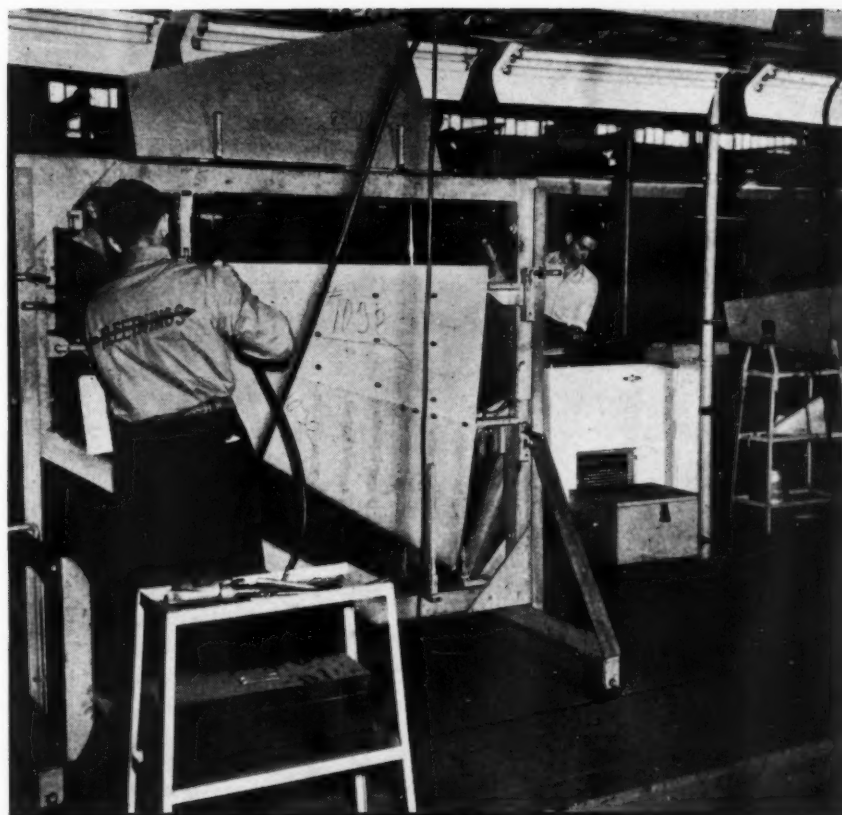
At the Fleetwing plant, the available general lighting system, 300-watt reflectors on approximately 16-foot centers was insufficient for the critical work involved. The supplementary lighting equipment was designed, therefore, to provide the higher intensities necessary at the working stations. Under the tunnels the actual illumination averages 53 foot-candles on the work, although at some operations it is in the order of 100 foot-candles depending on the angle of the working plane and the position of the frame within the tunnel.

The tunnels consist of a series of 12-foot units, usually six in a section. A 2-inch pipe frame supports a 2-inch angle iron structure approximately eight-feet above the platform. Fluorescent lighting fixtures, 2 lamp, 48-inch



Fluorescent tunnel for high intensity lighting on assembly lines, units are semi-portable, coupled by cords and plugs. Plug receptacles permit connection of portable electric tools.

ANGLE MOUNTING at low height throws light effectively on vertical surfaces. Frame also supports piping for air powered tools.

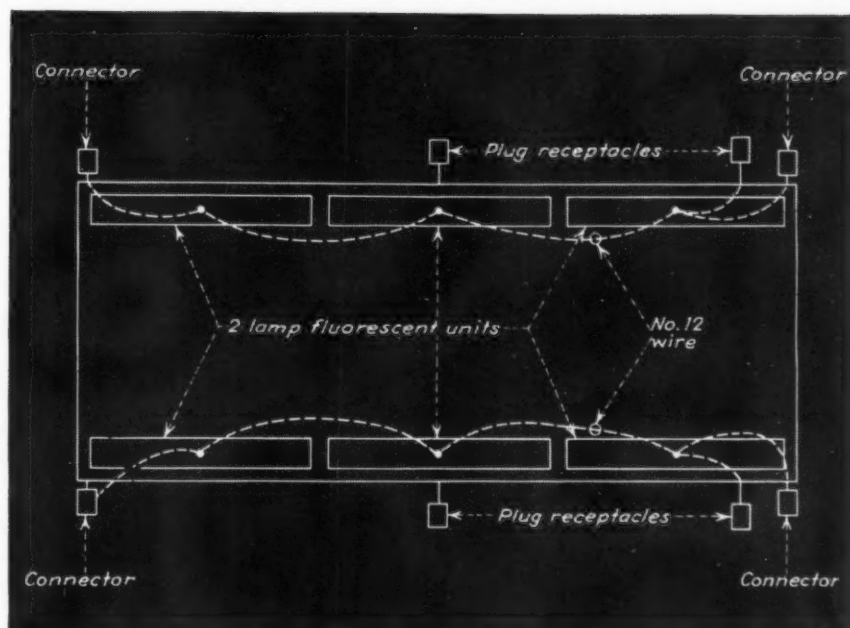


for PRODUCTION LIGHTING

industrial Hygrade Miralumes, are mounted three to a unit along both sides suspended at seven feet from the platform and tipped at a 30 degree angle inward toward the work.

The units are wired with E.M.T. and flexible conduit and are coupled together with heavy duty Tyrex rubber covered No. 12 cords and heavy duty plugs and receptacles. Each unit is wired with two circuits, one for the lights and plug receptacles on each side. The circuits are terminated in a panel-board at the end of the section. Panel feeders, four No. 4 RH wires in 1½-inch conduit are extended to the main lighting distribution panel.

The entire lighting sections are readily movable and may be quickly shifted to accommodate production line changes. The system is especially economical in materials as the units are placed only where the work requires good lighting. Areas used for material handling and aisles depend upon the conventional overhead general lighting.



SCHEMATIC DIAGRAM of the tunnel lighting, three four foot fixtures are mounted on each side, circuits terminating in connectors at each end.

Glare for Protection

Negative illumination goes to work to guard important war industries and vital civil services as lighting engineers design floodlights for controlled glare.



SPECIAL LIGHTS designed to provide controlled beams for fence floodlighting.

REDOUBLED precautions against sabotage and espionage has prevented the fires and explosions that marked the early months of the first World War. Early in the Defense Program, F.B.I. agents worked with management to provide protective lighting equipment around industrial plants and important civil works to prevent trespassing at night. And out of this need has come several types of lighting units and installations specially designed for a unique and unorthodox job

PROTECTIVE LIGHTING of boundary fences around important plants prevents trespassing and sabotage.



Glare has been put to work. The fresnel lens units, lighting engineers have designed for fence area lighting, are made to throw beams of a very narrow vertical angle but with a broad horizontal sweep. The result is effective floodlighting of the area beyond the fence when viewed from the patrol road but a blinding and inescapable glare when viewed from outside.

The application of this type of floodlighting requires careful planning with special concern not only for the lighting job but for the police job which it supplements.

1. Lighting units should be mounted as low as is practical and behind the fence line. The usual arrangement is about 15 feet high and 15 feet behind an ordinary 9-foot fence and 150 feet apart.
2. The main beam should clear the fence. A brightly lighted fence tends to screen the area beyond.
3. The cut-off angle should effectively shield the patrol road from spill light. Properly installed glare lighting makes

it impossible for the intruder to follow the patrol or observe its schedule.

4. Glare lighting should be used with due regard for safety on adjoining highways and railroad tracks. Other types of units and different lighting methods may be indicated.

Another type of unit has the appearance of a conventional street light. It is mounted at normal height, about 25-feet, on a gooseneck above the fence. By reflection and refraction in the specially designed enclosing globe, the light is directed in a flat beam with the cut-off adjustable to avoid lighting the patrol road or producing glare in adjoining roads. The choice of units depends upon the specific conditions around the plant.

Fence lighting equipment is usually available for series operation on street lighting circuits or conventional parallel circuits at normal secondary voltages. In parallel wiring, the long circuits require special consideration for voltage losses. Overhead open wiring is common practice but better protection against sabotage is provided by underground lines and provisions for feeding from more than one point.

IMPENETRABLE GLARE shields patrol roads and buildings. Intruders cannot observe guard locations or routine.



3 Facts of Vital Importance to Production Today

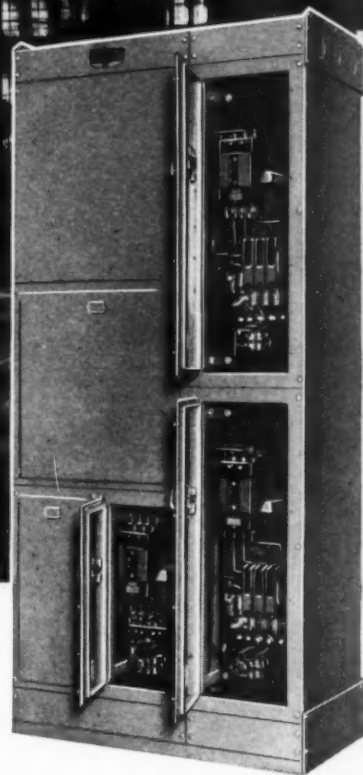
With every moment of time, every foot of production space, every work unit of manpower of such vital importance, look to Unitrol to wipe out the problem of handling, housing and using Motor Control.

- 1 Unitrol simplifies and speeds up the installation of Motor Control whether *inside* a machine, *beside* a machine or in a control center serving an entire plant or department.
- 2 Unitrol simplifies and speeds up the addition, change, replacement and servicing of Motor Control. It makes control always easily accessible . . . separates control from machine, maintenance from production. It keeps control abreast of changing needs.
- 3 Unitrol cuts down the space required by Motor Control . . . enables you to get more than double the amount of control in the same space . . . may even make plant extensions unnecessary.

The complete Unitrol story is told in the book "Unitrol . . . the next step forward in Motor Control progress."

It's yours for the asking. But send for it *today*. CUTLER-HAMMER, Inc., 1306 St. Paul Ave., Milwaukee, Wis. Associate: Canadian Cutler-Hammer, Ltd., Toronto.

1892-1942 50th ANNIVERSARY

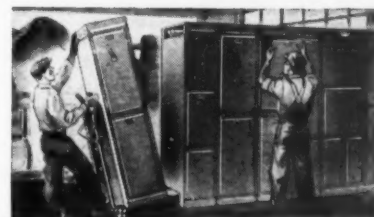


Unitrol is a better method of mounting, housing and centralizing Motor Control . . . from the individual unit up to the complete plant-serving motor control center. It is made up from standardized interchangeable parts. It is complete and usable at every step of the way. It is inexpensive, speedy and easy to install, demount or change. It is as "flexible as a rubber band."



The individual Unitrol Section houses Motor Control for several motors or motorized machines, is compact, space-saving, convenient and economical. No supports, no other structures or preparation necessary.

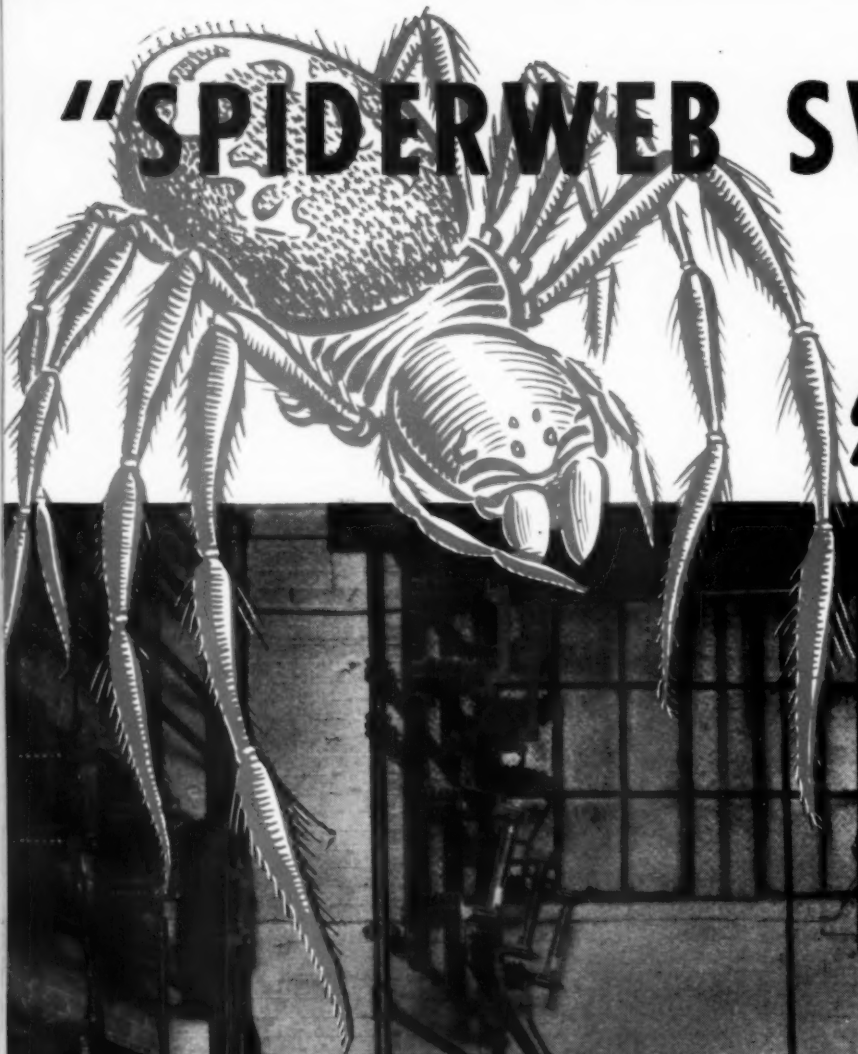
↑ The individual Unitrol mounting frame is better for machines with built-in Motor Control. It eliminates many machining, wiring and assembling operations.



The complete Unitrol Control Center houses all the control and control equipment in the plant, for easy, speedy man-power-saving installation, maintenance, change, expansion or curtailment. No wall or floor preparation. No racks, trellises or frames. Permits installation of more than double as much control in same space.

"SPIDERWEB SWITCHGEAR"

*will tangle up
your production!*



ALL YOUR POWER
GOES THROUGH
YOUR SWITCHGEAR



Here's the METAL-CLAD ANSWER



**Completely Enclosed in
Grounded Metal—to Protect
Your Personnel and Safe-
guard Continuous Production**

You Get All This:-

COMPLETE CO-ORDINATION of switchgear devices. All the devices are designed to operate as a unit.

LOW PREDICTABLE INSTALLATION TIME—AND COST. The equipment is *complete* and ready to install as a unit.

SAFETY. All conducting parts are amply in-

sulated, and located behind grounded walls of metal. Every part is made to withstand short-circuit stresses equal to the rating of the breaker.

EASY, SAFE INSPECTION. The breakers are easily removable, and can be withdrawn and replaced in a few minutes. You can inspect them away from all live parts.

Write for Bulletins GEA-2499 and GEA-3083 (up to 15 kv) and GEA-2249 (up to 5 kv). General Electric Company, Schenectady, N. Y.



General Electric and its employees are proud of the Navy award of Excellence made to its Erie Works for the manufacture of naval ordnance.

GENERAL ELECTRIC

804-18-7500

Editorials

Selective Service

Uncle Sam is digging deeper into his stock pile of available man-power. We are warned that there are no industry exemptions. The Army and Navy are in dire need of skilled craftsmen and complete supervisors.

To create the huge armed force now contemplated by the Selective Service Board will draw upon our roster of mechanics and office staffs at a time when they are already involved in essential and vital war work. Yet we cannot expect them to be deferred indefinitely.

Draft Boards have been lenient in the past, but each draftee is coming up for review again. Essential work must not be interrupted, but employers may be asked to explain what steps have been taken to replace Class 2 employees if they are called.

In wiring work, the shortage of skilled men has been severe for many months. Many older men have come back and more may be pried out of less essential jobs by the prevailing good wages and overtime.

But among the younger men we can count on losing a large proportion to military service soon. The effects will be serious unless we anticipate the problem and make plans to substitute older men when the call comes.

Light Levels Up

Since the introduction of the fluorescent lamp, concepts of what constitutes good lighting have had to be radically revised. When given a free choice, most people would select levels higher than lighting engineers were prepared to provide practically with

incandescent lighting equipment. Consequently, many of our "recommended standards" were a cautious compromise between what lighting ought to be and what was practical.

Our sights have been raised. The 100 foot-candle job is wholly practical with fluorescent lighting equipment. But, though new "recommended standards" are higher and better, it must be kept in mind that they, too, are still a compromise based on the progress in the art up to now.

As new lighting levels become practical, the horizon of optimum lighting recedes. Color, quality and direction take on added importance. The possibilities of future lighting development still dwarfs what progress we have made so far.

Blackout Contractors

As the original flush of enthusiastic confusion over blackout precautions settles down to serious planning and comprehensive methods, there are still few places where a factory or store manager can order skillful and complete blackout service.

Let us urge again that this work is a logical venture for electrical contractors. They have the knowledge of lighting and the mechanical ingenuity that blackout preparations require.

There is far too much amateur effort now, well meant but ineffectual. Blackouts are serious business. The protection of cities from aerial attack is a job for experts. And the problems presented in blackout work are not far different than specialized lighting work.

Get your name before the public now and take over the blackout business. It's important work.

Repair Parts Boom

Urgent orders for repair parts for motors and controllers are reaching new highs. Besides the rapid depreciation and wear on equipment under twenty-four hour schedules, much older equipment is being renovated and restored to useful life.

Still another factor in the repair parts boom is more preventive maintenance. Apparatus cannot be allowed to fail, or depreciate to the point where repair by simple parts replacement is impossible. New equipment is too hard to obtain.

Out of war time necessity may come a new interest in the routine type of maintenance that keeps equipment in good-as-new condition by carefully scheduled checking, repair and reconditioning.

Electronic Controls

Out of the war time acceleration of industrial operations, the development of electronic control apparatus has been phenomenal. Much of it is devoted to strictly military and naval projects and consequently may be held in the file of military secrets for the duration. But some new developments are already available to the industrial market.

One device recently announced provides continuously variable speed control from a small dial at the push button station. It operates a direct current motor from a.c. lines providing constant speed characteristics and full motor protection.

There are others, characterized mostly by their facility in doing complicated or delicate jobs with more than human accuracy. And, as a rule, the apparatus is sturdy, adaptable, and easily wired. It is a field that foresighted electrical men will do well to watch.

Estimating Schools

Last year a group of Minnesota contractors held an estimating school to brush up on methods. A Chicago group is now spending two nights a week on a similar project. There is also some talk of a "correspondence course"

headed up by a faculty of nationally known estimators.

The purpose of all their efforts is not to train new estimators so much as to develop better standards of estimating practice. Is it all worthwhile in these days when price is no longer the final word in contracting? That is a fair question.

Skilled estimating with well supported labor units and competent methods of take off and tabulation serves essential needs beyond a low competitive price. It provides an accurate quantity survey, a labor hour analysis, a cash flow schedule and an index of tool requirements. Whether the estimate contributes information for the contract price agreement between the contractor and purchaser or not, job efficiency, timing of material orders and delivery, labor and tool schedules are all dependent upon estimating.

A good brush-up on methods is more necessary today than ever. More study groups should be organized. For it is toward these essential by-products of skillful estimating that cooperative study contribute most.

After It's Over

Electrical contractors are wondering what will happen to their business after the war is over. Will there be a terrific let-down? What can they do about it?

It is not too soon to plan for post-war business nor for contractors to do a bit of fact finding of their own. Civilian goods plants will come back into the picture again. Stores, offices and homes will be remodeled. But, will the electrical system in each case be adequate and safe?

That is something the electrical contractor can and should find out. Why not make a survey in your local community, now; list the electrical needs and be ready to follow up when the war is over. A little effort along these lines now will pay dividends later, when they may be needed most.

Transformer Protection

In a report on bomb damage to electrical equipment in England, it was indicated that 60 per cent of the damage to transformers occurred in outdoor installations. Bomb fragments or

anti-aircraft shell splinters which punctured the shell caused most of the trouble.

The writer comments that blast proof walls are needed to guard the equipment and localize the damage. Many of our own industrial plant substations remain relatively unprotected. Concrete enclosures would require little in the way of scarce materials. Why not get the protection in place now, before the bombs come?

Keep Up Standards

A report on a check of 50 "priority houses" on the west coast shows that the number of electrical outlets had been cut to 20. And defense house livability is being sacrificed. The maximum number of outlets permitted by OPM in these units averages 32 to 36.

We are under severe restrictions, but we can at least install the number of outlets permitted under priority ratings. More than that we should strive to make provisions, now, for the installation of more outlets after the war.

Here is an industry problem that the electrical contractor can tackle aggressively. It will mean work now and more later. The defense worker deserves decent electrical conveniences. So let's not let our own restrictions undermine the standards we have all fought to maintain.

About Censorship

We all know our newspapers and general magazines are now operating under a strict censorship code. This publication, too, operates under the new rules. But it is unlikely that our censorship would be apparent to other than especially critical readers looking for the symptoms. The kind of specific information, the details of methods and practices that provide the bulk of this paper are still printable.

Certain facts and figures will be omitted from time to time. Air views, full floor plans, exact geographic locations, may not appear with some stories pertaining to important plants. These we must leave out to avoid "aid and comfort" to the enemy or directions to saboteurs. In this we are cooperating fully with the Office of Censorship in Washington.

The rules are eminently sensible. The channels for exchanging industrial experience and methods still remain virtually free. There will be no black-out on information which helps industrial progress in America. Of this we may be certain.

Higher Numbers

Several special industries enjoy higher priority ratings on repairs for breakdowns, notably mining and petroleum. The preference order procedure is somewhat different from that on P-100. Watch out for these higher ratings and use them when you can. That's what they are for.

Back Talk

Fluorescent Fixture Construction

To the Editor—"We contractors are always trying our best to use Underwriters approved and locally approved merchandise. Many of us have been giving our customers guarantees up to five years or so, and we did not lose on the guarantee. However, we now have a fluorescent fixture problem: (1) There are different cities of the United States. This tends to increase the cost of approved fixtures. (2) The parts in the fixtures, such as starters, for example, are so constructed that they burn out or are easily replaced with defective ones.

"I would suggest a construction that would allow the contractor to easily disconnect the fixture and take it to a more suitable place to service it. If possible, even the customer should be able to take it down, deliver it to the contractor's office to be serviced. These construction features can be made without making the fixture a fire hazard, but on the contrary, it would allow more approved fixtures to be sold by lowering the original and maintenance costs. There is also no reason why the ballasts, sockets and starters should not be constructed in a manner so that they will last for a period of at least five years.

"We must not forget that it is the contractor who has to take all of the blame if something goes out of order, and he also has a hard time in explaining why some non-approved fixtures may be easier to maintain and service than approved ones."

Harold Schamban
Chicago, Illinois

A good set of ideas about fluorescent fixture construction. When contractors guarantee fluorescent lighting jobs there should be some protection against unauthorized starter replacement. However, recent practice has been to restrict the guarantee of fluorescent lighting equipment to a shorter period than the wiring.

The rules pertaining to permanent installation of fluorescent fixtures to discourage the lamp socket or globe holder type of suspension are perfectly sound. They need not, however, bar the development of a safe but readily demountable type of fluorescent fixture support. There is a distinct need for this kind of attachment for many commercial fixture installations.

WIRING

Methods

BASEMENT TRANSFORMER ROOM VENTILATION

In making an electrical system changeover from direct to alternating current in an old Philadelphia office building, the J. F. Buchanan Electric Co., electrical contractors of Philadelphia, was faced with the problem of ventilating a basement transformer room.

The building, which was constructed about 1897, has large granite blocks and brick bases to support the large brick columns in the structure. Brick arches built above and below the basement floor level provide additional support to the building structure. These arches run parallel to outside of the building.

The new transformer room is located between four of these column foundations. The ventilating system, designed by the J. F. Buchanan Electric Co., includes a 3-ft. by 4-ft. concrete air duct which extends from one side of the room, through the arches to an open area beyond. This area extends about five feet beyond the building line to a retaining wall directly under the sidewalk. The area above the air duct is

covered by outside steps which lead down to stores located on an intermediate floor directly above the transformer room.

The vertical risers in these steps were removed and replaced with open grilles thus providing an inlet for the outside air. A french drain was installed in the floor of this area to remove any water which may enter through the open stair grilles. This provides a satisfactory method of ventilating this out-of-the-way transformer room.

JOB PRINTS

On a large building project, distribution lines between buildings were shown on a large print over 7 feet long. Copies of the plant, needed for several crews, proved awkward to handle in the open.

Superintendent G. F. Ehrlich of the Wetherbee Electric Co. of Oklahoma City had a number of photostat reproductions made reducing the size to approximately 24 by 15 inches. These were pasted up on stiff cardboard. The



SMALL SCALE photostat copies of large prints prove handy for the job. Superintendent G. F. Ehrlich of Wetherbee Electric shows a plot plan reduced from a 7-foot blueprint.

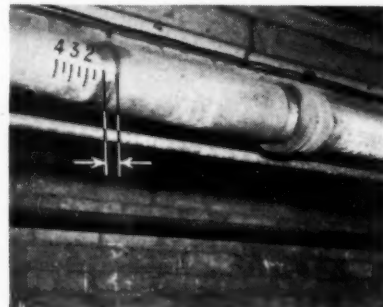
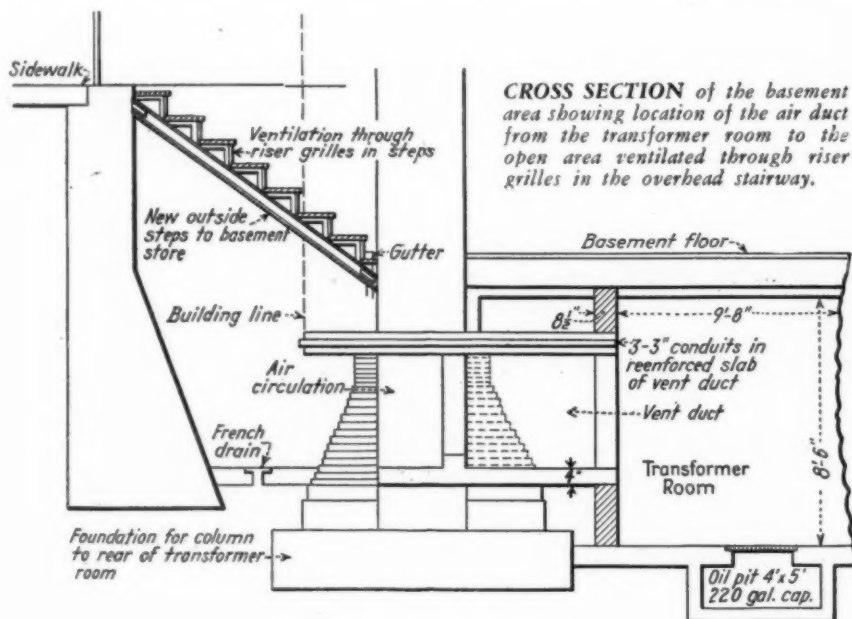
reduced size made for convenient handling and, in spite of the considerably reduced scale, the original lettering was perfectly clear and readable.

The same method is being applied to all plot plans or diagrams that do not require scale measurements. The reproduction also shows crayon alterations or notes made on the master blueprint without requiring corrections in the original tracing.

CONDUIT EXPANSION JOINT

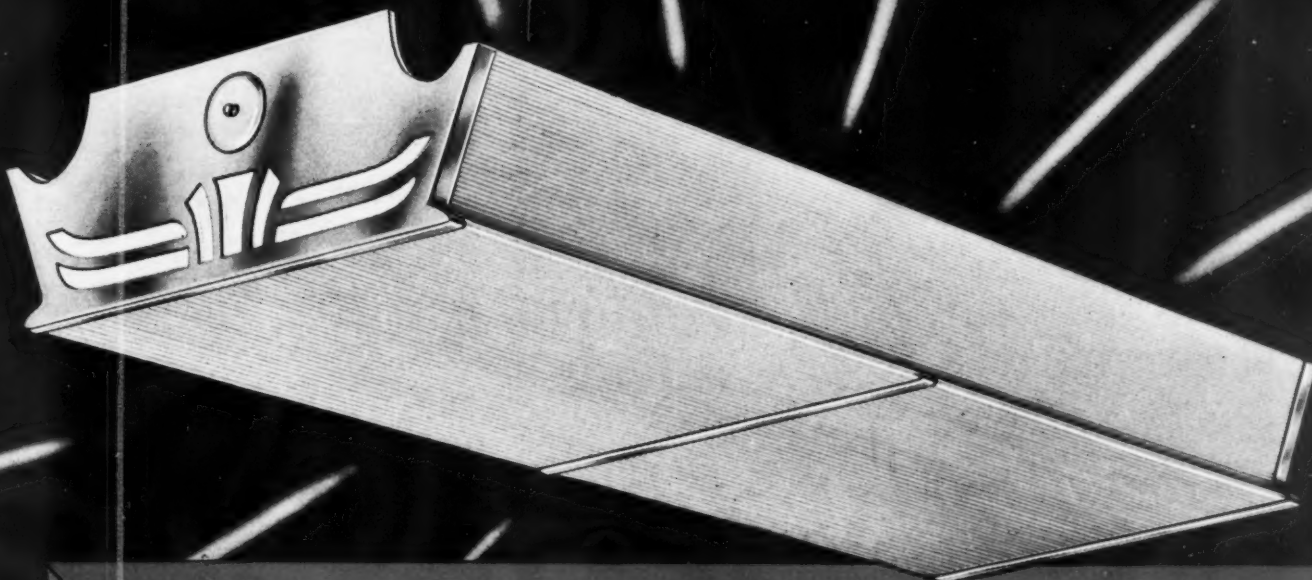
To take care of contraction and expansion due to temperature variations, the R. A. Turner Co., Inc., electrical contractors of Springfield, Mass., installed two expansion joints in a 730-ft. run of 3-inch conduit mounted under the canopy of an outdoor loading platform.

Each joint, located about 240-ft. from



SLEEVE JOINT permits contraction and expansion of a long conduit run. Flexible copper strap forms ground continuity. Area between arrows indicated contraction during winter months.

each end of the run, consists of a 16-inch sleeve of 3½-inch conduit connected to one end of the 3-inch line by a reducing



ANNOUNCING

the Revolutionary Mitchell

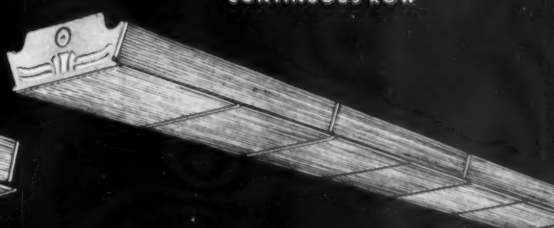
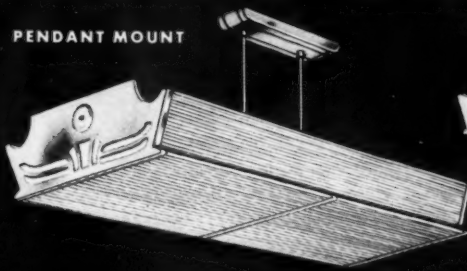
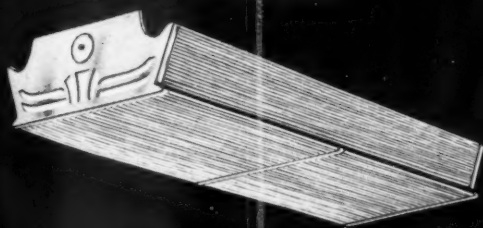
U.R.C. RESEARCH Luminaire

THE MOST SIGNIFICANT MAJOR DEVELOPMENT
IN THE ANNALS OF FLUORESCENT LIGHTING!

CEILING MOUNT

PENDANT MOUNT

CONTINUOUS ROW



3 TYPES OF INSTALLATIONS WITH 1 MODEL



TWO YEARS OF INTENSIVE RESEARCH

by the Utilities Research Commission now brings you an utterly NEW, LOW-COST SHIELDED FLUORESCENT FIXTURE offering greater all-around lighting benefits than any fixture previously conceived . . . the new U.R.C. RESEARCH LUMINAIRE! Read the amazing story of this history-making lighting development on the inside pages!

**ELECTRICAL
CONTRACTORS!**

NEW
U.R.C. IS THE FLUORESCENT—
"Made to Order" FOR CONTRACTORS!

U.R.C. IS UTILITY-DESIGNED AND BACKED
U.R.C. IS "BETTER LIGHT, BETTER SIGHT" FLUORESCENT
U.R.C. WINS INSTANT CUSTOMER ACCEPTANCE
U.R.C. IS EASIEST YET TO INSTALL, MAINTAIN
U.R.C. IS UNBELIEVABLY LOW PRICED!
IT WILL PAY YOU TO READ EVERY WORD ON THESE PAGES!

UTILITIES RESEARCH COMMISSION *Designed IT!* MITCHELL *Manufactures IT!*

What Is the U.R.C. Research Luminaire? It is an utterly NEW shielded 200-watt 4-Light Fluorescent Fixture that provides lighting vastly superior to that of any previous fixture . . . the result of over two years of scientific research and development.

Who Developed It? A committee of outstanding lighting engineers appointed by the Utilities Research Commission.

Why Was It Developed? Bare lamp fixtures and the majority of "shielded" fixtures are objectionable for many lighting applications. Serious need long has been felt for a Fluorescent unit that would meet all Better Light, Better Sight requirements, obtainable at no greater cost than ordinary fixtures. The new U.R.C. Research Luminaire fills those needs more completely than any fixture yet developed for commercial lighting application.

What Are the Advantages of the U.R.C. Over Other Fixtures? The 8 important features listed below are not claims, but facts, based on the findings of the Utilities Research Commission lighting engineers, whose work is independent of all lighting manufacturers. Compare these features with those of any existing fixture!

1. Extremely Flexible. Three major types of lighting installations can be made with one model: (1) Individual ceiling mounting; (2) Individual pendant mounting; and (3) Continuous row mounting. This eliminates the need for special ordering from factory, because the one model only need be stocked, with quick service and installation assured. (See chart 2 on opposite page.)

2. Higher Lighting Efficiency! With the U.R.C. Luminaire it is possible to build up higher illumination values . . . from 50 to 100 footcandles! . . . (See charts 6 and 8 on opposite page.)

3. Low Brightness. The higher lighting intensities provided are achieved with a lower surface brightness than ever before attainable. The average conventional shielded fixture today has brightness as high as 3 and 4 candlepower per square inch. Bare lamp fixtures even higher. At all normal viewing angles, the U.R.C. brightness does not exceed 0.9 candlepower per square inch!

4. Easy and Quick Installation. U.R.C. features an entirely new method of installation which makes the hanging of a fixture a matter of minutes. Metal tracks, fastened to the ceiling by toggle bolts or Ackerman, are lined up four feet apart. The fixture section simply "slides into place" on the tracks. Repeated time checks reveal that U.R.C. Luminaire can be installed in one-half to one-third the time of ordinary fixtures. (See charts 3 and 4 on opposite page.)

5. Easier to Relamp and Maintain. Relamping is quickly accomplished by removing bottom glass panels. Side panels need not be removed. Starters can be removed without disturbing lamps. No tools required to remove glass panels for cleaning. Any unit in a continuous row may be disconnected completely and easily at any time. (See chart 5 on opposite page.)

6. Design Is Modern and Functional—pleasant to the eye—suitable for office, store or any other commercial installation.

7. Meets All Better Light, Better Sight Requirements.

8. Unbelievably Low Price! Despite the fact that it represents a completely new concept of Fluorescent Lighting, with demonstrably superior features throughout, the Mitchell U.R.C. Research Luminaire costs no more than the average, ordinary 4-light fixture! The U.R.C. has a list price of only \$39.95 complete, less bulbs. (When Pendant Mounting type is desired the Stem Suspension Set, consisting of two stems with canopy and strap, is available at a list price of \$1.75.)

MODEL NO. 2032
MITCHELL
U.R.C. Research
Luminaire } List Price
\$39.95
Less Bulbs

(West and South \$43.95)

No. 032 ST Stem Suspension Set for above \$1.75



INDIVIDUAL CEILING MOUNTED



SINGLE CONTINUOUS ROW



INDIVIDUAL PENDANT MOUNTED



CONTINUOUS ROWS

A RADICALLY NEW AND BETTER FORM OF LIGHTING

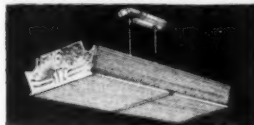
JUST CHECK THESE OUTSTANDING ADVANTAGES AND COMPARE WITH ANY OTHER FIXTURE!



A *Beautiful* PACKAGE OF
PERFECTED FLUORESCENT LIGHT
FOR ANY COMMERCIAL USE

1

3 APPLICATIONS WITH ONE MODEL!



1. For Pendant Mounting



2. For Individual Ceiling Mounting



2

3. For Continuous Row Mounting

EASY TO INSTALL!



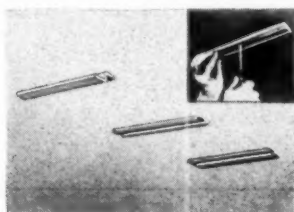
Just Slide on to Tracks



A matter of minutes to fasten each
track to ceiling, slide and lock fixture
in place, splice to outlet and insert
glass... requires less time and effort
to install than any other fixture

3

TWO TYPES OF TRACKS FOR CONTINUOUS ROW AND CEILING MOUNTING



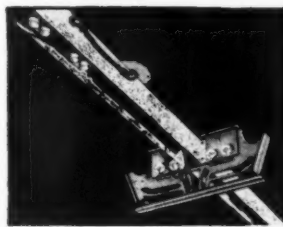
Single track used when units
are mounted individually



Double track used where units
join for end-to-end mounting

4

EASY TO MAINTAIN!



1. Glass panels easily removable
for relamping and cleaning
2. Starters replaceable without
disturbing lamps
3. Wiring channel accessible...
just remove 2 wing nuts

5

HIGHER LIGHT INTENSITIES!

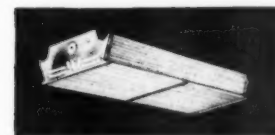
Compared with Incandescent



4 Ft. Candles
Per Watt
Per Sq. Ft.



7 1/2 Ft. Candles
Per Watt
Per Sq. Ft.



U. R. C.
FLUORESCENT 16 fc. Per Watt
FIXTURE Per Sq. Ft.

6

LOW BRIGHTNESS!

ORDINARY SHIELDED FIXTURES



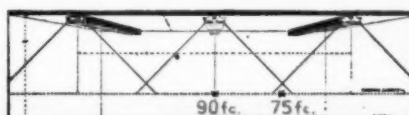
Excessive glare, with brightness as high
as 3 and 4 CP per square inch



Brightness does not exceed 0.9 CP
per square inch

7

HIGHEST EFFICIENCY



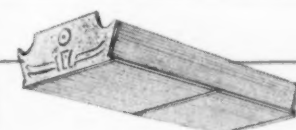
THREE CONTINUOUS ROWS
U. R. C. LUMINAIRE
IN 10-FT. SPACING
AVERAGE 65 FOOT CANDLES

8

UNBELIEVABLY LOW PRICE!



Ordinary 4-Lite Exposed
Tube Fixture Average List, \$38⁰⁰



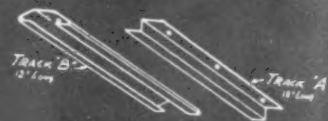
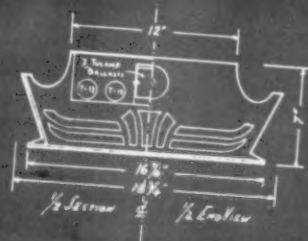
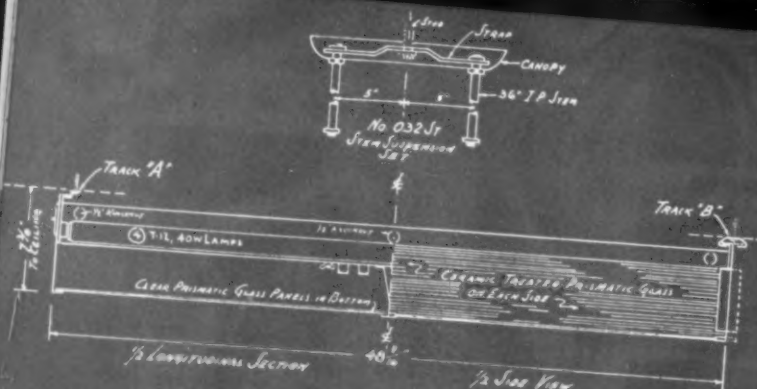
U. R. C. FIXTURE
LISTS AT ONLY... \$39⁹⁵

9

FOR OFFICES, STORES AND OTHER COMMERCIAL APPLICATIONS

INSTALLATION AND LIGHTING DATA

Mitchell U.R.C. RESEARCH Luminaire



SPECIFICATIONS—MODEL NO. 2032

This fixture is designed for mounting directly to the surface of the ceiling, either as an individual unit or end-to-end to form a continuous row. Also it can be used for pendant hanging, with Model 032-ST Stem Suspension Set, which consists of two 36\"/>

CHASSIS: Constructed from a single sheet of steel with trunk cover of No. 18 U.S.S.G. (.050\") secured to body with two wing nuts. Two knockouts provided on the top for mounting of stems if fixture is used for pendant hanging. 1/2\"/>

END PLATES: 20 gauge steel (.0375\") and finished in Satin Aluminum. Knockout provided for 3/8\"/>

TRACK MOUNTING: Mounting to surface of ceiling is made by means of track sections "A" and "B," made of No. 18 U.S.S.G. steel. Track "A" is single type used on ends of continuous rows, or when single unit is surface ceiling mounted. Track "B" is double type used when two units are joined

together end to end. Packed as standard equipment with each fixture are two type "A" tracks and one type "B" track.

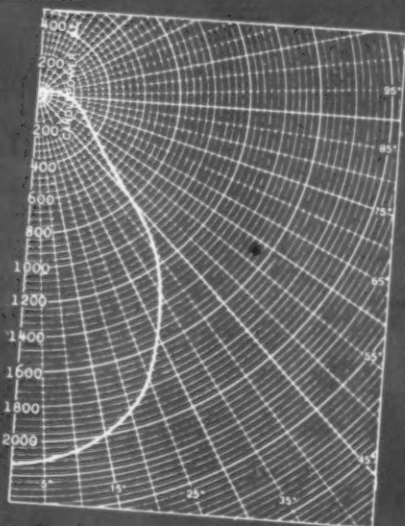
DIFFUSING PANELS: Side panels consist of double strength ribbed ceramic-coated glass. When fixture is lighted, glass is uniform throughout, and has a transmission factor of approximately 35%. Edges are ground smooth. The bottom panels are double-strength prismatic ribbed glass with transmission of not less than 85%. Edges ground smooth.

BALLASTS, STARTERS, ETC.: Latest, approved Tulamp Ballasts. Starter switches latest, standard type, located so they may be replaced without disturbing lamps. Unit bears Underwriters' Laboratories and U.R.C. Certification Labels.

Unit operates on 110-125 volts, 60 cycles, Alternating Current. (Available for 50 cycle on special order, \$5.50 extra.) Shipping weight 55 lbs., packed one unit to a carton.

List Price: Model No. 2032 MITCHELL U. R. C. Luminaire. \$39.95

List Price: No. 032-ST Stem Suspension Set for above, consisting of 2-36\"/>



LUMINAIRE DISTRIBUTION DATA					
MID-ZONE ANGLES	APP. C. P.	ZONAL LUMENS	MID-ZONE ANGLES	APP. C. P.	ZONAL LUMENS
180°			90°		
175°			85°	215	235
165°			75°	226	239
155°			65°	328	328
145°			55°	438	392
135°	6	5	45°	854	661
125°	22	20	35°	1320	829
115°	52	51	25°	1762	816
105°	134	142	15°	1984	561
95°	159	173	5°	2097	200
			0°		



DESIGNED BY
UTILITIES RESEARCH COMMISSION

Manufactured by..



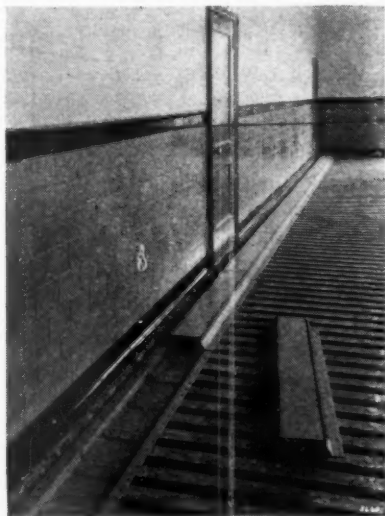
coupling. The other side of the sleeve slides snugly over the break in the conduit line. A thin film of grease over the inserted portion of the conduit line keeps the expansion joint from binding or "freezing". Continuity of the metallic ground is maintained by a section of flexible copper strap soldered to the 3-inch line and the expansion sleeve.

The installation was made at 20 degrees Fahrenheit. A scale, divided in inches, painted on the 3-inch conduit at its junction with the free end of the sleeve is used to record the amount of contraction or expansion. Readings taken six months after installation, at a temperature above 90 degrees F., indicated a total expansion of 2 1/4 inches in the two joints, one showing a movement of 1 1/8 inches.

CONTINUOUS ACCESS HEADER

Continuous access to the numerous underfloor raceways used in a Robertson cellular steel floor installation in the Municipal Fire Alarm Headquarters at Washington, D. C., is provided by a header running the entire length of the room and close to one wall.

The access header is so constructed that the top is flush with the concrete floor after pouring. The covers of the continuous header are made up of a number of removable sections. Each cover has enough clearance to allow



EASY ACCESS to all electrical circuits running in the cells of this cellular floor installation is provided by this continuous access header along the length of the room.

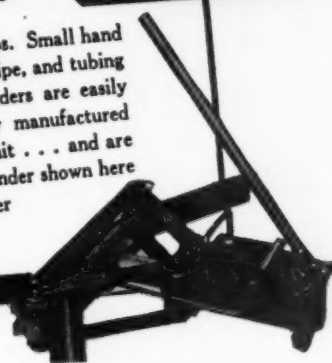
SAVE HOURS OF WORK

Cut labor costs and save vital hours on your defense jobs by turning to a better use of tools. Greenlee Tools are saving hundreds of contractors on defense jobs from 15 to 75% in time and labor costs by making the work easier and faster for the man on the job. Find out how Greenlee Hand Tools can help speed up your jobs . . . write for new Catalog 33-E.

**ON DEFENSE JOBS
WITH THESE
GREENLEE
TOOLS**

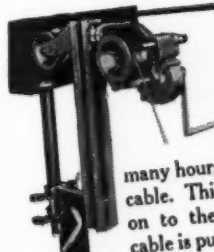
COMPLETE LINE OF BENDERS

There's a Greenlee Bender for any of your bending jobs. Small hand benders and powerful hydraulic benders for conduit, pipe, and tubing from 1/4 to 4 1/2-inch size. Greenlee Hydraulic Benders are easily operated by one man . . . save the cost of many manufactured bends and fittings . . . are compactly built in one unit . . . and are easily carried to the job and set up. The No. 770 Bender shown here will bend 1 1/4 to 3-inch pipe while the No. 775 Bender will handle 3 to 4 1/2-inch material.



No. 765 CABLE PULLER

The Greenlee No. 765 Cable Puller will save many hours of work when pulling in cable. This handy tool clamps right on to the conduit through which cable is pulled . . . is easily carried to the job . . . can be set up in a jiffy . . . and is easy for one man to operate with one or two hand cranks. This cable puller, with a maximum pull of 7,500 pounds has two speeds, weighs only 170 pounds, and can be clamped to 2 to 5-inch conduit.



KNOCKOUT TOOLS

Greenlee Knockout Punches and Cutters will enlarge holes in metal up to 1/2-inch thick without long tedious drilling, reaming, and filing. A Knockout Cutter or Punch is inserted in a knockout or a small drilled hole, a few turns of the drive nut with an ordinary wrench, and a hole up to 3 1/4 inches can be cut in 1 1/2 minutes or less.



HYDRAULIC PIPE PUSHERS

Greenlee Hydraulic Pipe Pushers eliminate digging long trenches, tearing up lawns, breaking through concrete, backfilling, and tamping when installing pipe underground. Only a short trench men can pump pushing Pusher will inch size will handle crete sewer pipe is required and one or two easily push the pipe by the handles. The No. 790 push pipe from 1 1/4 to 4 1/2 while the No. 795 Pusher large drainage ducts, con-pipe, and pipe beyond 4 in.



OTHER GREENLEE TOOLS TO SAVE YOU TIME

The four popular tools shown here are but part of the complete Greenlee Line of Hand Tools. In addition to these tools there's a complete selection of Boring Tools, Spiral Screw Drivers, Push Drills, Joist Borers, Spiral Screw Drivers, Chisels and Gouges.

**Send for
NEW GREENLEE
CATALOG 33-E**

GREENLEE TOOL CO.

1742 COLUMBIA AVE., ROCKFORD, ILL.

FOR EVERY INDUSTRIAL, COMMERCIAL
OR RESIDENTIAL REQUIREMENT...
Sell the time-saving line...

LATROBE

FLOOR BOXES and WIRING SPECIALTIES

No. 284 DUPLEX RECEPTACLE NOZZLE



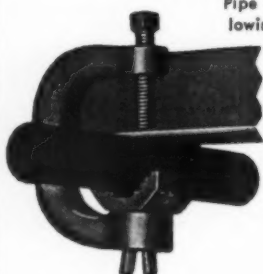
Compact and neat. Available with 1½" and ¾" brass pipe extension. Also LATROBE Duplex Telephone Nozzles.



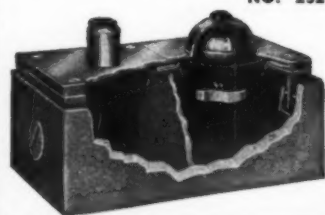
NO. 110 NON-ADJUSTABLE WATER TIGHT FLOOR BOX

Cutaway view shows how tapered unit receptacle fits tapered opening in top of box body. The latest in design, appearance and simplicity of installation.

NO. 470 PIPE OR CONDUIT HANGER



Pipe support turns freely, allowing pipe to run parallel or at right angles to beam. Does away with drilling or use of straps. Handles ½", ¾" and 1" pipe to steel beams ¾" thick.



NO. 252-R TWO GANG BOX

Two gang adjustable floor box with No. 208 receptacle in one section. One cover plate with ½" flush brass plug and the other cover with 2" flush brass plug.



Write for details TODAY!

FULLMAN MANUFACTURING COMPANY
LATROBE • • • PENNSYLVANIA

WIRING
Methods

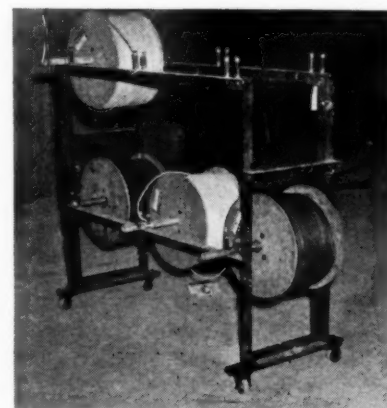
[FROM PAGE 37]

linoleum or other floor covering to be placed over it and still be flush with the guide flange.

In this particular installation, about every third floor cell contains a different alarm circuit and quick and easy access to all circuits is necessary to maintain uninterrupted alarm service. The electrical installation in this building was made by E. C. Ernst, Inc., electrical contractors of Washington, D. C.

PORTABLE REEL RACK

A portable reel rack made of 2-inch angle iron and capable of holding six reels, each with 4,000 feet of No. 12 wire, is used by the Hixon Electric Co., electrical contractors and engineers of Boston. Although it was originally designed for use in hospital work where



REEL CARRIAGE capable of carrying six reels totaling 24,000 feet of No. 12 wire, facilitates wiring in buildings cut up by numerous partitions

nurses' call systems take six wires, it is now employed in wiring all buildings where the floor area is cut up by corridors and partitions. It is constructed narrow enough to go through all types of doorways.

The rack is 55-inches long, 50-inches high and about 16-inches wide. The horizontal and vertical side members are welded together; the horizontal cross pieces on the ends as well as caster supports are bolted to facilitate dismantling. The stops for the reel rods are constructed of ¾-inch nipples, 3-inches long, bolted to the angle iron by ¼-inch bolts. The reels are set on 24-inch centers, the lower support being 22-inches from the ground.

Why You Should

INSIST...



NAME OF MANUFACTURER

COMPLIANCE WITH
SPECIFICATIONS UNDER
APPROVED INSPECTION
PROCEDURE OF RLM STANDARDS
INSTITUTE CERTIFIED BY
ELECTRICAL TESTING
LABORATORIES

On Industrial Fluorescent Units **CERTIFIED BY RLM**

This simple buying step is your best assurance that the Industrial Fluorescent Lighting Units you install will provide the maximum value in lighting efficiency and economy... will deliver the balanced lighting so essential to maximum output of National Defense Products... will protect the welfare and promote the efficiency of employees called upon to work longer hours and at higher speeds.

Specifications for Certified RLM Industrial Fluorescent Units have been established by extensive research and scientific tests. Conformity to RLM Specifications by all RLM labeled Industrial Fluorescent Lighting Units is assured by a rigid and continuous inspection and testing system conducted by Electrical Testing Laboratories.

Thus, the RLM LABEL becomes the user's warranty that the fixtures, auxiliary control equipment, sockets and other component parts of the Lighting Unit bearing it are properly engineered for co-ordinated operation with Mazda Fluorescent Lamps to give maximum light output and trouble-free operation. Write for copies of RLM Specifications.

The Letters RLM Stand for Reflector and Lighting Equipment Manufacturers

RLM STANDARDS INSTITUTE
INCORPORATED

307 N. MICHIGAN AVE. • SUITE 1600 • CHICAGO, ILL.



RLM Specifications Industrial Fluorescent Units

Specification No. 5:
48" Fluorescent Two-Lamp
Closed-End Porcelain En-
amel Unit.

Specification No. 6:
48" Fluorescent Three-
Lamp Closed-End Porce-
lain Enamel Unit.

Specification No. 7:
60" Fluorescent Two-Lamp
Closed-End Porcelain En-
amel Unit.

Specification No. 8:
60" Fluorescent Two-Lamp
Closed-End Porcelain En-
amel Diffuser Unit.

Specification No. 9:
48" Fluorescent Two-Lamp
Open-End Porcelain En-
amel Unit.

Specification No. 10:
48" Fluorescent Three-
Lamp Open-End Porcelain
Enamel Unit.

Specification No. 11:
60" Fluorescent Two-Lamp
Open-End Porcelain En-
amel Unit.

Specification No. 12:
60" Fluorescent Two-Lamp
Open-End Porcelain En-
amel Diffuser Unit.

Guarantee

This RLM certified lighting unit, when properly installed and under normal conditions of use, is guaranteed against mechanical and electrical defects for a period of 90 days from date of delivery to the purchaser. Correction of such defects by repair or replacement of material only shall constitute fulfillment of all obligations under this guarantee by the undersigned manufacturer or distributor.

RUBBER COVERED POWER CABLES • BUILDING WIRE

CRESFLEX NON-METALLIC SHEATHED CABLE • SERVICE ENTRANCE CABLE • MAGNET WIRE • BARE WIRE

CRESCENT

Genuine **A.B.C.**

**Armored
Bushed
Cable**

SAFEST
Factory Assembled
Wiring
System



CONDUCTORS—Clean stripping insulation and flame retarding covering, printed as shown.

BUSHING—easy to insert as paper unwraps from under both ends of armor to make room for the bushing.

STEEL ARMOR—good conductivity, electro-galvanized for maximum uniformity and longest life.

TESTED—Thoroughly tested at several points during manufacture and receiving a final test of 2000 volts between conductors and armor.

CRESCENT has unexcelled facilities for the COMPLETE manufacture of Armored Bushed Cable in all its steps. When you buy CRESCENT A.B.C. ARMORED BUSHED CABLE you buy the best. Do not be satisfied with any substitute.

CRESCENT INSULATED WIRE & CABLE CO.

ASK YOUR JOBBER



CRESCENT

WIRE and CABLE

Factory: TRENTON, N. J.—Stocks in Principal Cities

CRESCENT ENDURITE SUPER • AGING INSULATION

Switching For Alerts

[FROM PAGE 19]

installed in feeder circuits to main lighting panels, omitting circuits serving emergency corridor lighting panels or panels serving obscured areas.

The contactors are usually grouped in the switchboard room but may be located adjacent to the panels on each floor. A central switch panel equipped with tell-tale lamps and individual switches provides for quick operation and the circuits may be restored one at a time. An improvement is a single switch operating an interlock circuit as shown in diagram 1. Only the first contactor is operated by the switch, the rest following in regular order. The opening sequence is rapid, the closing delayed by any convenient interval between as set by the time delay mechanism.

For operating lights in remote locations the same type of circuit may be used, the last live circuit extended to the operating coil of the next contactor. This saves long control lines and may be readily adapted to a group of buildings served from several sources.

Display Windows

The emergency switch for show windows and other unoccupied buildings is arranged for operation by the neighborhood air warden or policeman. The holding circuit on the main contactor is extended to a push button set high on the door frame within reach of police baton. With this circuit the lights cannot be restored.

A block of stores may arrange an interlocked circuit linking all to one point of control at one end of the block. However, this arrangement must be handled through mutual agreement as to hours of normal operation, because clock operation of one circuit will darken all the windows beyond at the same time.

In general, switching for blackouts should provide for centralized control under constant supervision or for convenient operation by persons specially delegated to handle the lighting in emergencies. Where such supervision is impractical a simple, well marked and convenient point of control should be installed accessible to air raid wardens. While many ingenious methods of control are available, the simplest and most positive system is the best for ordinary use.

"No Blink"

Says the Wise Old Owl



when YOU Use Lloyd's New No Blink Starters

Lloyd leads again! The last word in "no-blink" starter construction! Has the rigid glass stem assembly that insures perfect alignment of parts and perfect operation. Combines with it a "long life" automatic thermal switch which opens the circuit if a lamp fails to light. Absolutely stops blinking and flickering of lamps which have gone bad. Interchangeable with FS-4 for use with 40-watt lamps only.

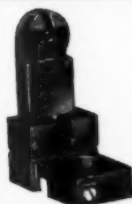
Lloyd Policy Insures Quality

LLOYD PRODUCTS COMPANY

Box C Edgewood Station

Providence, R. I.

Representatives, Branch Offices and Warehouses in 22 Leading Cities



Lloyd
Twist Type
Lamp Holder
with
Starter Socket
Blk. Cat. 353
Wht. Cat. 353-W
Combined with
Starter Socket
Cat. 252
Pats. Pend.



Lloyd
Starters
FS-2
15-W 18" lamps
20-W 24" lamps
FS-4
30-W 36" lamps
40-W 48" lamps
FS-6 100-Watt



Lloyd
Starter Socket
with
"Lobster Claw"
Reg. U. S. Pat. Office
Dual Lock
Blk. Cat. 252
Pat. Pend.



Lloyd
Push Type
Lamp Holder
with
Starter Socket
Blk. Cat. 253
Wht. Cat. 253-W
Combined with
Starter Socket
Cat. 252
Pats. Pend.

**In Fluorescent you'll
go further with . . .**

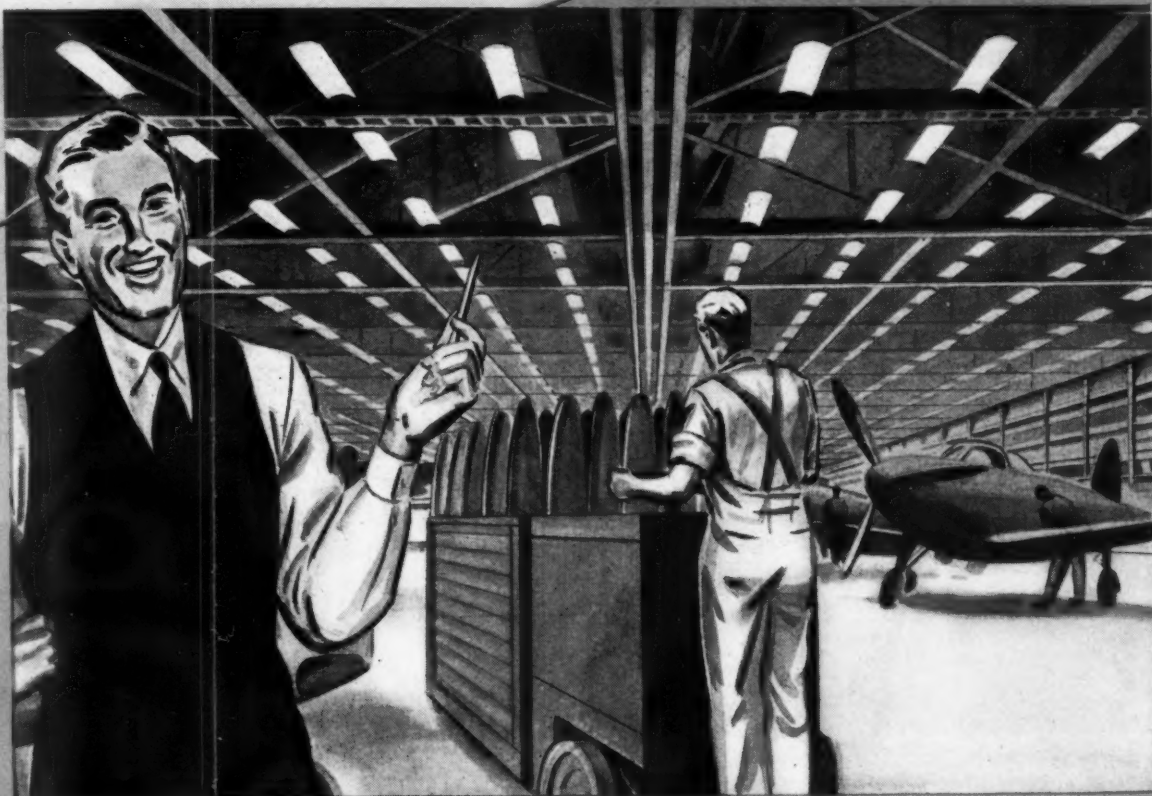


Westinghouse Mazda



When you build your reputation on first-class, top-notch fluorescent installations you boost your business and your profits. One quality job helps get others. And quality jobs mean bigger profits and less service expense.

So, recommend *quality* fixtures and give your customers the lamps they know they can depend on—Westinghouse Mazda Fluorescent Lamps. When you say "Westinghouse Mazda" your customers know they are getting lamps built to give top-notch performance and greater dependability. Sell top-quality Westinghouse Mazda fluorescent and you'll have more satisfied customers.



Replacement lamp business is ready and waiting

Throughout the country are thousands of plants and offices already equipped with fluorescent lighting. These firms need and want top-quality fluorescent lamps for replacement purposes. This is a business that is becoming bigger and more profitable day after day.

When you sell Westinghouse Mazda Fluorescent Lamps your customers know you are recommending top quality. They know Westinghouse is the company with a 55-year-old reputation for sound engineering and dependable manufac-

turing. You'll get more fluorescent replacement business when you sell Westinghouse Mazda Fluorescent Lamps.

Today, prices on Westinghouse Mazda Fluorescent Lamps are the lowest in history. The popular 40-watt T12, in daylight, and 3500° white were reduced from \$1.35 to \$1.15 each. Other sizes and colors were also reduced in price on January 1st. Westinghouse Electric and Manufacturing Company, Lamp Division, Bloomfield, New Jersey.

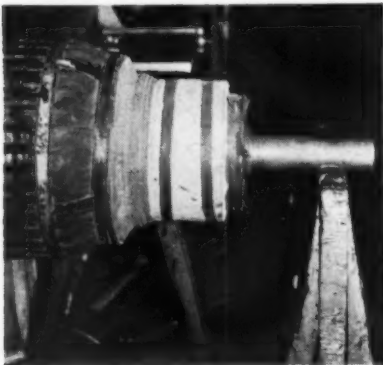
For DEPENDABLE Fluorescent Lighting consult your
Westinghouse MAZDA LAMP DISTRIBUTOR

Motor Shops

COMMUTATOR GUARD

A simple protective wrapping over the commutator while it is trucked to and from the shop affords some mechanical protection and makes a good impression on the customer.

The Dodge Electric Supply & Service



PROTECTIVE WRAPPING over commutator during pickup, delivery and handling prevents injury to bars.

Co. of Tulsa, Oklahoma wraps several layers of heavy Kraft paper over the commutator bars as soon as the armature is removed from the frame. It is again wrapped up for delivery after repairs are completed. The paper is held securely in place with two or three turns of ordinary friction tape.

REAMER VISE

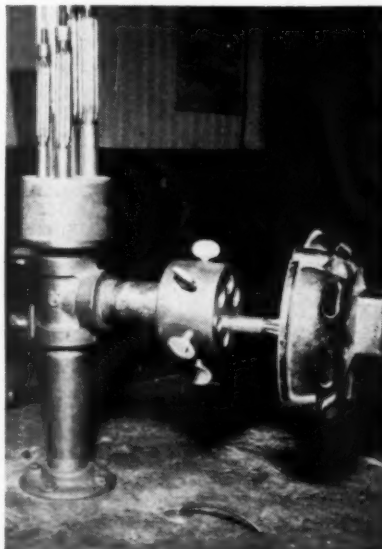
The small motor department of the J & H Electric Company, Providence, R. I., have designed and built a combination vise and rack for bearing reamers.

The device consists of a solid steel block, cut from a piece of 3½-inch shafting and welded to a 1¼-inch pipe nipple. This nipple is mounted horizontally to a pipe T which is supported by piece of 1¼-inch pipe fastened to the bench top by a floor flange. The vise block is 2¼ inches thick and contains six horizontal bores of various diameters

to hold reamers from ½ inch to 1½ inch in size. An additional hole is to be drilled in the center of the block to take a 1½-inch reamer. The reamers are held straight and rigid by thumb screws which fit in holes drilled and tapped through the diameter of the block. The vise arm has 360 degree free movement in a horizontal plane, so it can be used from either side of the bench or at any horizontal angle.

The reamer rack consists of a wood block, a duplicate of the steel block, mounted to an inverted floor flange. The flange is fastened to a short pipe nipple which telescopes into the vertical vise support. There is no threaded connection and it can be easily lifted out.

The superintendent of the small motor department states that they save 75 per cent of the time originally spent in reaming bearings through the use of this new device. This is due to its handy location and the fact that all the reamers are racked right at the vise, thus saving steps ordinarily wasted in getting and replacing the tools.



BEARING REAMING is a snap with the use of this combination vise and rack in the small motor department of this Providence motor shop. Wire measuring device on bench top also speeds assembly operations.

Not connected with the operation of the reamer vise, but shown in the accompanying photograph is a clever little wire measuring device. It consists of a small brass bushing in the table top and centered in a 24-inch diameter circle on the table. Motor lead wire, mounted on a suspended reel under the bench, is threaded through the bushing. Since all their motor leads are standardized at 12 inches in length, the mechanics pull the wire to the edge of the circle and clip it off at the bushing. This method, they say, eliminates waste and speeds up motor assembly through saving time in measuring wire. Both of the above devices aid in the reduction of unit costs in small motor work, all of which is in line with their new straight line assembly method in the new small motor department.

CARBORUNDUM CUTTING WHEEL

Cutting steel shafting and other types of steel materials is no longer a problem at Ferry Electric Service, motor repair shop in Pittsburgh, Pa. To speed up this phase of their shop work



RAPID CUTTING of steel shafting and angle and flat iron is now possible by the use of a carborundum cutting wheel in this motor repair shop.

they have built a cutting machine that employs a carborundum wheel as the actual cutting medium.

The wheel is ⅝-in. thick and 12 inches in diameter and except for a small portion where the work is fed, it is completely enclosed by a solid metal guard. The wheel rotates on ball bearings and is driven by a belt-connected one hp., 3-phase, 220-volt, 1800 r.p.m. motor.

A pivoted guide mechanism on the front of the cutter serves to hold the shafting, angle iron or flat iron rigidly during the actual cutting operation. Safety glasses are worn by the operator during the cutting period which takes but a few seconds, depending of course on the size of shaft or metal being cut.

Porcelain Products, Inc.

CABLE ADDRESS: PORCELAIN
CODES: I CODE, ABC 6th ED.

ELECTRICAL PORCELAIN • SINCE 1894

FINDLAY, OHIO • U. S. A.

PLANTS: PARKERSBURG, W. VA.
FINDLAY, OHIO • CAREY, OHIO

AN OPEN LETTER

TO ALL ELECTRICAL CONTRACTORS:

Porcelain Wiring Systems will help beat Hitler and the Japs.
This is not a quip but the solemn truth.

Let's have a little straight thinking on this subject. It is asserted on the highest authority that America will win this war through super-production and conservation of critical materials. Mr. Donald Nelson of the new War Production Board says — "We can't waste anything". Senator Truman's investigating committee points out the dire urgency for stopping waste and extravagance.

PORCELAIN WIRING conserves desperately needed STEEL, COPPER, RUBBER, ZINC and PAPER. PORCELAIN WIRING means KNOB and TUBE Wiring with PORCELAIN OUTLET BOXES. The potential savings reduced to pounds and tons are almost unbelievably immense and, interpreted into guns, tanks, and armor, take on a new and very significant meaning — a challenge to the Electrical Industry.

All this does not stop with a mere gesture of patriotism. The service record of Porcelain Wiring over the past half century is its own best proof of Economy, Efficiency, Permanence, and Safety. We assert without reservation that Knob and Tube Wiring, properly installed per Code, is the safest of all recognized methods of wiring. For verification check Underwriters' reports on electrical fires and accidents.

Porcelain Knobs and Tubes INVOLVE NO CRITICAL OR SCARCE MATERIALS, except a relatively insignificant quantity of nails. We believe that the merest common sense leads to the inescapable conclusion that the efficient prosecution of our war effort places Porcelain Wiring in predominance over all other known methods.

The time is short. The urgent need for material reinforcements for American men and boys fighting against medieval barbarism in the far corners of the earth compels the Electrical Industry to re-value present existing wiring methods in light of common sense.

PORCELAIN PRODUCTS, INC.

PORCELAIN PROTECTED WIRING SYSTEMS SAVE VITAL WAR MATERIALS

Electrical Contracting, February 1942

To get more
jobs done
this year

SPEED UP



They're Better Looking

The sleek, round-cornered case in which these starters are furnished makes them fit in appropriately in the best-looking plants. And they're more compact.

They're Convenient

Having the manual switch and the magnetic starter at the same point—near the job—the operator has quick access to the control in an emergency.

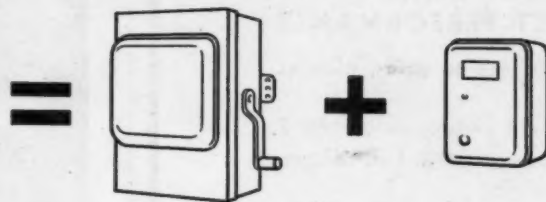
They're Safer

When a man is inspecting the starter, he can be sure he's protected—someone else can't accidentally close the disconnect, because it's safety-interlocked.

INSTALLATION OF CONTROL



BY USING G-E
COMBINATION STARTERS



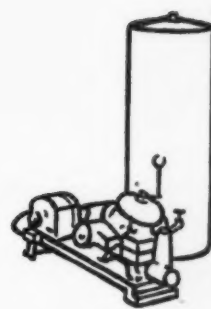
THIS *Instead of* THIS and THIS

WITH your electrical crews hurrying from one job to another trying to keep up with promise dates—wouldn't you welcome a suggestion that would cut wiring time per job? Especially if it actually gave the client a better installation—better looking, in a smaller space, and safer for his workmen.

The G-E combination starter does just that. By installing a *single* device for each motor, you virtually cut in two the time required for installation. And this modern control affords all the advantages we have mentioned.

Further Information

G-E distributors have stocks of these starters for prompt delivery. A post card will bring complete information, including prices. Address our nearest distributor, or General Electric Co., Schenectady, N. Y.



You Wouldn't Install
a Pump without a
Pressure Switch

Why Risk Installing a Motor
without Overload Protection

Anyone knows that a pump without a pressure switch would be a menace—one man would have to be assigned to watch the pressure gage constantly. Similarly, why expect a motor to operate without overload protection? Overheating may injure the windings or cause bearing failure, which means costly production tie-ups, and service calls that are costly in time and customer good will. Be sure the motors you install are properly protected—

GENERAL  ELECTRIC

USE G-E STARTERS LIKE
THIS, WITH ISOTHERMIC
OVERLOAD RELAYS

IRVINGTON SCORES AGAIN NEW

FIBRONIZED KOROSEAL* TUBING



FOR ELECTRICAL INSULATION

Used by many large manufacturers in electronics, instruments, aircraft, electrical appliances and power industries.

FIBRONIZED KOROSEAL* TUBING'S outstanding properties include inside and outside smoothness, exceptional elasticity, closer manufacturing tolerances. Will enable you to use it in intricate applications to improve the product and cut manufacturing costs.

FIBRONIZED KOROSEAL* TUBING FOR PERFECT PERFORMANCE

- Excellent resistance to acids, alkalis, solvents
- Continuous heat resistance at 160° F.
- Insulation resistance 90% R.H. 16 hours at 105° F.—infinity
- Fireproof. Does not support combustion,
- Retains flexibility after being subjected to 225° F. for approximately 1000 hours (A.S.T.M. Test)
- Tensile strength—2,845 lbs. per sq. in.
- Dry dielectric strength (.022" wall thickness)—1050 VPM
- Wet dielectric strength (.022" wall thickness)—817 VPM after 24 hours immersion

Meets or excels all A.S.T.M. specifications. Comes in A.S.T.M. sizes and in a variety of colors. Is also available in transparent shade.

The Fibron Division of Irvington Varnish & Insulator Co., leaders in the pioneering, development and manufacture of extruded tubing for electrical insulation, invites you to test FIBRONIZED KOROSEAL* TUBING.

Submit your specific problems to our Fibron Engineers, Department 96. They will recommend the right tubing, furnish samples and complete test data.

*KOROSEAL—a trademarked name of B. F. Goodrich Company



Irvington

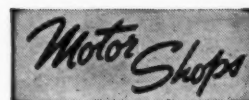
VARNISH & INSULATOR CO.

IRVINGTON, NEW JERSEY,
U. S. A.



PLANTS AT
IRVINGTON, N. J.
HAMILTON, ONT., CAN.

Representatives in 20 Principal Cities

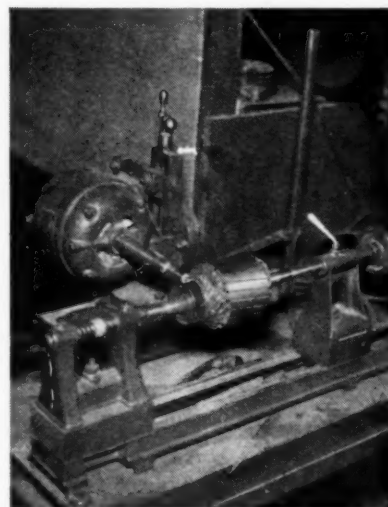


[FROM PAGE 44]

The complete unit takes comparatively little space on the top of the work bench and has proved to be a great time saver to the boys in the shop.

PRECISION UNDERCUTTING

An adjustable, motor operated cutting head and a rigid armature holder are arranged for precision undercutting



UNDERCUTTING TOOL on adjustable support provides accurate work on small commutators.

work on commutators at the Western Electric Machinery Co. shop in Wichita, Kansas.

The armature holder is adjustable for the shaft length. The ball bearing motor and cutter are mounted on a tool support which allows accurate vertical adjustments and permits the tool to work at any angle.

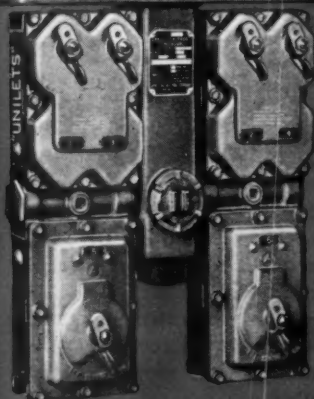
The cutter assembly rides on a sliding base operated by a long lever.

FIELD DRYING OF MOTORS

Drying out a generator and exciter that had been submerged in a floor was a comparatively simple job for the East Tennessee Light and Power Company. They did it at the job site without the necessity of disassembling or moving the equipment to a shop for repair.

A number of G.E. R-40 drying lamps were mounted to circular wood racks which were mounted on each side of the open ends of the generator and exciter. The diameters of the racks

Don't Run This Risk!



Type "FLP" Explosion-Proof Panel Board (Six-Circuit)

Type "EVA" Explosion-Proof Lighting Fixture (Pendant Type)



Type "FSQX" Explosion-Proof Interlocking Type Safety Switch and Type "FP" Plug



Type "OFC" Explosion-Proof Outlet—For Oil-Immersed or Air-Break Switches



Type "ARTC" Explosion-Proof Circuit Breaking Switch Unit

Install APPLETON EXPLOSION-PROOF Fittings in Hazardous Locations!

One spark can wreck a business; it can wipe out plant equipment vitally needed right now for production! Be alert to the danger of explosion—insist on Appleton Explosion-Proof Fittings for all hazardous locations! They are expertly designed and carefully built to conform exactly to every code requirement. They offer a *wide margin* of protection.

The Appleton Explosion-Proof

line is *complete*, with a size and type perfectly suited to every installation however unusual. Molded in Appleton's own foundries, they are of high uniform quality—rugged, smooth malleable castings. Accurately finished and heavily cadmium coated.

Whatever your fitting requirements, save time in ordering, and on the job, by specifying Appleton —"STANDARD FOR BETTER WIRING!"

Sold Through Wholesalers

APPLETON ELECTRIC COMPANY
1704 WELLINGTON AVENUE • CHICAGO, ILLINOIS

Branch Offices: NEW YORK, 76 Ninth Avenue • DETROIT, 7310 Woodward Avenue • CLEVELAND, 824 Keith Bldg. • SAN FRANCISCO, 655 Minna Street • ST. LOUIS, 420 Frisco Bldg. • LOS ANGELES, 100 North Santa Fe Avenue • ATLANTA, 203 Luckie Street, N.W. • BIRMINGHAM, 6 N. Twenty-First Street • MINNEAPOLIS, 305 Fifth Street, S. • PITTSBURGH, 418 Bessemer Bldg.

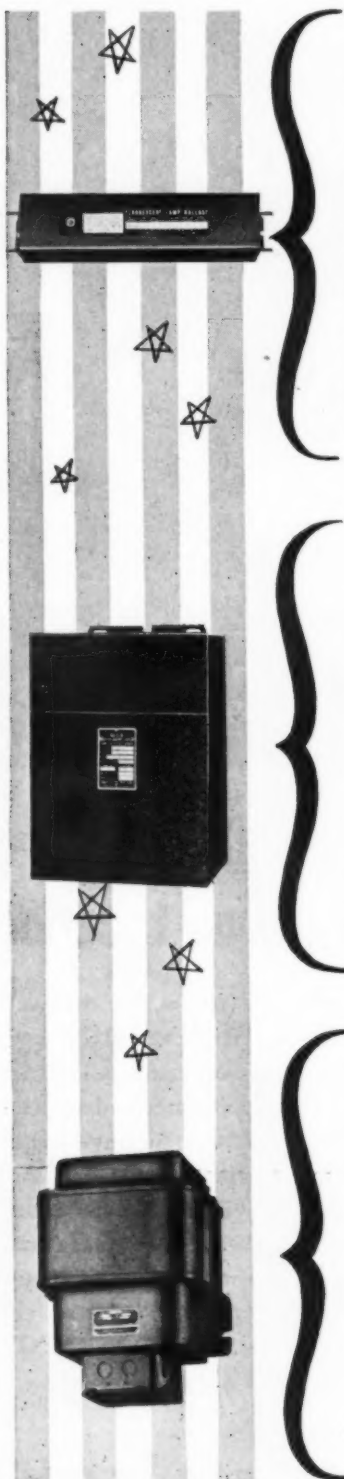
Resident Representatives: Baltimore, Boston, Cincinnati, Dallas, Denver, Kansas City, Milwaukee, New Haven, New Orleans, Philadelphia, Seattle

APPLETON

CONDUIT FITTINGS • OUTLET AND SWITCH BOXES • EXPLOSION-PROOF FITTINGS • REELITE

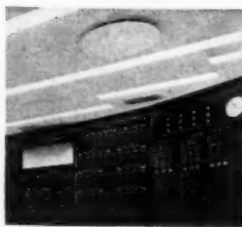
INDUSTRY *for* DEFENSE

finds these SOLA transformers essential



for FLUORESCENT LIGHTS

Specified and used in many important air fields and defense plants, Sola fluorescent lamp ballasts guard against untimely failures and costly production delays. Their efficiency prevents excessive drain on already overloaded supply lines. Their small size permits use of compact fixtures, releasing excess vital materials for other use. Standard or constant voltage units available in single or 2-lamp capacities.



Ask for bulletin JFL-86

for MERCURY LAMPS

The uniformly high power factor (98%+) of Sola Mercury vapor lamp transformers imposes no wattless load on power systems. Completely independent of line voltage changes, they prevent lamp outage due to line voltage drops. They increase lamp life by insuring perfect lamp operation regardless of line voltage levels, and automatically protect supply circuits and fuses from disruption should lamp failure occur.



Ask for bulletin JMV-81

for POWER and CONTROL

It is far more economical to operate tools, power jigs and independent lighting circuits from higher voltage power lines. Where existing service lines are already loaded to maximum, their capacity can be increased by supplying them at higher voltages using Sola transformers to reduce the higher voltages to lower voltage levels. Air-cooled, double wound and auto types—.050 to 25 KVA—housing or encased types. Rugged heavy duty types specially designed for lighting and general power applications.

Ask for bulletin JPC-14

LISTED BY UNDERWRITERS LABORATORIES



SOLA ELECTRIC COMPANY

TRANSFORMERS

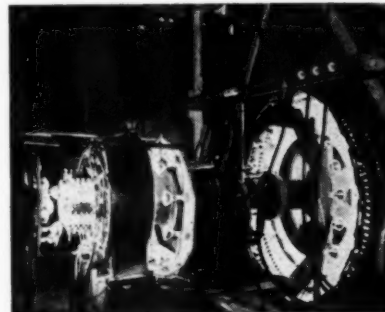
2525 CLYBOURN AVE., CHICAGO, ILL.

Motor Shops

[FROM PAGE 48]

were slightly less than that of the stators so the heat could be concentrated directly at the water-soaked windings.

The equipment was thoroughly dried out because the infra-red lamp has a



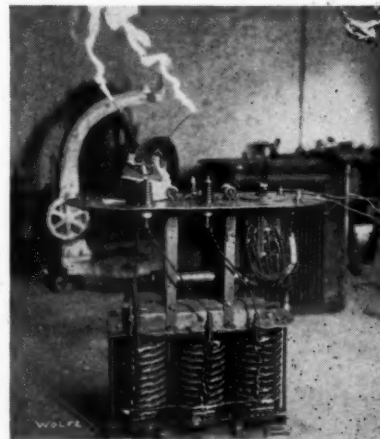
HEAT DRYING with infra-red lamps proved to be the solution to rehabilitating this water soaked generator and exciter.

penetrating characteristic and the coils were dried from the inside out, assuring the elimination of any damp coil sections.

RADIO TRANSFORMER REWIND

Careful insulation and rigid coil assembly are especially important in special transformer for radio transmitters, according to E. A. Jones of the Jones Electric Machinery Company, of Topeka, Kansas. The accompanying photo shows a recent rewind job on a power transformer for WIBW.

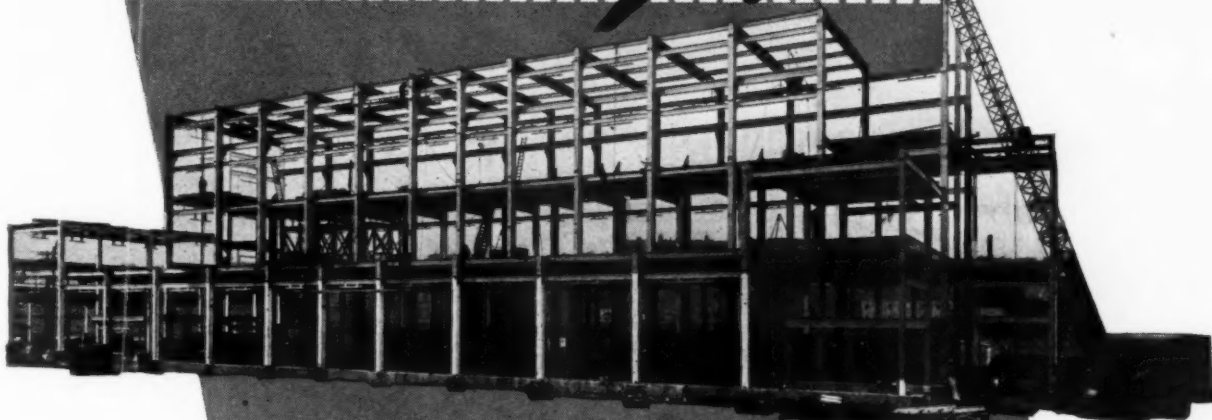
The rotor switch in the 220 volt, 3 phase delta primary changer taps to adjust to variations in primary line voltage. The secondary is rated at 11,500 volts, 3 phase, Y, which rectified, provides the main power supply to the transmitter tubes.



CRITICAL INSULATION and coil assembly is required on step-up power transformer for radio service.

CONSTRUCTION DEADLINE

60 days!



SPEED VITAL WIRING INSTALLATIONS

WITH

CENTRAL RIGID STEEL CONDUIT

The positive uniformity, easy workability, accurate threads and the rugged dependability of Central Rigid Steel Conduit places "Central" at the top of your list of essentials for speedy construction. You specify both the best and easiest-to-use conduit obtainable when you specify Central Rigid Steel Conduit.

For Sale By
SPANG CHALFANT, INC.

General Offices:
GRANT BUILDING, PITTSBURGH, PA.
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in Principal Cities



Partners in Defense

*P*roduction and use of steel are teamwork jobs. Neither one can exist without the other. Through forty-one years, Youngstown and its customers have been partners in helping America to build for progress and prosperity.

Now the emergency has interfered with our normal relationships. New demands impose burdens and restrictions on us all. But we believe you will see clearly with us that the solution of our problems, both national and individual, lies in mutual cooperation.

Let us remember that today you and we are partners in a new sense—partners for the protection of America.

THE YOUNGSTOWN SHEET AND TUBE COMPANY
YOUNGSTOWN, OHIO

25-30D

Industrial Electrification

TO CUT WASTE

THERE is a close and logical relation between plant disorder and waste. The obvious hazards of littered floors and careless accumulation of materials to men and machines are widely recognized. But cluttered shops also breed significant waste in time, in important and scarce materials and in power.

We cannot afford waste. Time and scarce materials cannot be valued today in terms of just dollars and cents. For in war, waste is a loss which cannot be balanced by profit. And sound plant housekeeping is an effective way to plug these unseen, unrecorded losses.

Plant housekeeping is no longer a frill or a fetish of dirt hating executives. It is an important part of the manufacturing process, as vital to production as the oil in a motor bearing. And like most other important processes the work has become electrified.

Power tools apply the paint for brightening dark corners. Industrial vacuum cleaners sweep the floors. Power driven dollies shift materials and light everywhere, exposes breaks in the housekeeping schedule. Clean-up is an electrical job.

Previous articles in this series covered the following subjects—

1. Simplifying Electrical Maintenance
2. Preventive Maintenance of Distribution Systems
3. Preventive Maintenance of Electrical Equipment
4. Reducing Power Costs
5. Maintaining Good Power Factor—Part I
6. Maintaining Good Power Factor—Part II
7. Meeting Severe Service Conditions
8. Eliminating Causes of Severe Service Conditions
9. Providing Adequate Capacity for Increased Demand
10. Electrifying Operations to Reduce Unit Costs
11. Safety Protection for Electrical Operations
12. Increasing Flexibility of Electrical Service
13. Electrical Aids to Automatic Control
14. Electrical Ways to Reduce Waste
15. How to Save Power
16. Protection Against Sabotage
17. Improving Working Conditions
18. Electrifying for Continuous Operation
19. Electrified Plant Housekeeping (this issue)
20. Electrical Aids to Quality Control
21. Electrifying for 168 Hour Schedules

ENGINEERING • INSTALLATION • MAINTENANCE

ELECTRIFIED PLANT HOUSEKEEPING

PRODUCTION efficiency is never a result of chance. It is attained only by planned order, in materials, machines, man power and the plant to house the process. And good plant housekeeping is a part of that order. In these days when every man-hour and every pound of material must be used to its full worth, the decks must be clear and clean.

To electrical men, the five "K's" of plant housekeeping are important to keep in mind, for in these days of mechanized clean-up much of the responsibility for organized maintenance is their's. They are—

- 1—Keep everything in order
- 2—Keep things clean
- 3—Keep repairs and replacements up to the minute
- 4—Keep free of fire and other hazards
- 5—Keep an attractive environment

If things are to be kept in order, there must first be a plant policy of "a place for everything and everything in its place and plenty of places for litter." And it should be made easy and convenient to comply with this policy.

The electrical man can stimulate orderliness if he keeps his tools and materials in proper receptacles. Too often the entire area around a maintenance job is cluttered up with tools. This practice is hazardous to other workmen. A small portable truck, with places for tools and materials, will keep these items out of the way and yet have them readily at hand when needed.

One type of disorder is frequently overlooked because the offending items are assumed to be in their proper posi-

tion. This is the practice of keeping excess raw materials and finished pieces stored at the machine. Correction of this condition offers several means of more economical operation in addition to better housekeeping.

More orderly care of stock will help relieve the shortage in scarce materials and will reduce the amount of added working capital called for by greater production. By establishing controls which insure a minimum of waiting raw materials, and handling methods which provide that this raw material is available at the machine and finished product immediately removed, the idle inventory will be greatly reduced. Power or gravity conveyors, electric or

INSERTING a cleaned Locktite reflector into a hood. The dirty reflector is then taken down off the ladder and scrubbed clean on the ground. It is then put into the next hood.





ELECTRICAL SUCTION provided by a vacuum cleaner captures the dust made in refinishing cloth at the Textile-leather Co., Toledo, Ohio.

hand trucks, hoists, chutes, and similar appropriate facilities will help in this close control of work in progress. By keeping materials moving, and off the floor, orderliness and cleanliness are made easier.

Improved stockroom lighting will help speed up distribution of tools and material. As individual items are more readily seen, identified and counted, stock check-up is made easier and quicker. Paint selected for its reflection and contrast value will prove its worth on walls and bins.

Receptacles for litter should be scattered throughout the plant in convenient locations. Having individual containers for different types of waste will make salvage easier. Oily rags and waste should be kept separate. All these receptacles should be of types providing safe storage until collection.

If local cleaning is made the responsibility of the individual workman, frequent collection will encourage more frequent cleaning up around his machine. Electric trucks adapted to this purpose will save time. Portable conveyors or hoists, power-driven from convenient outlets or from the truck battery, can be utilized if warranted.

Salvage of waste materials is almost always a definite source of revenue. Today salvage is almost mandatory as the scarcity of materials becomes more acute. Power driven baling machines for paper and metal scrap make these items easily salable. Extractors will salvage oils in metal working shops. Metallic particles can be separated from other waste by magnetic means. A salvage program opens the door to dollar savings.

Cleaning

Housekeeping in the plant is intended to make it a more sanitary, safer, and better place in which to work. The floor gets the most abuse and so requires most frequent attention. Once the apprentice-boy, the printer's-devil, or

some such person swept the shop first thing in the morning, before the working force arrived. Now, a day's accumulation of litter is not allowed to lay overnight. Safety, sanitation and non-stop operation will not permit it. Today, in most plants, a regular cleaning program is followed to which a special force is often assigned.

Industrial vacuum cleaners have replaced the broom and the brush. Handy power outlets allow these units to be moved around the plant as needed. With them dust and waste around machines and in the aisles are quickly whisked away. Spilled liquids or occasional overflows can be taken up as easily as dust. If the operations are such that scrubbing is necessary, electric scrubbers will do a quick and thorough job. Considering the saving in man-hours, there is little reason to question the manufacturers' claims of cost reductions ranging from 20 to 80 percent.

Although the type or construction of the flooring is neither a housekeeping nor an electrical job, a more suitable material or design should be suggested whenever areas show deterioration from abuse. Improper drainage where water, oil or acid may be spilled, or surfaces not designed to withstand liquids, excessive weight, heat or traffic conditions should call for rebuilding rather than repairing. If electrical conduits are in the floor, correction becomes a direct responsibility of the electrical man.

Keeping walls and ceilings clean presents tasks as varied as the plant operations. Grime will settle in any plant. This may require only periodic painting, or both cleaning and painting may be needed. The industrial vacuum cleaner is very effective in removing dust from walls, ceilings and beams.

Illumination

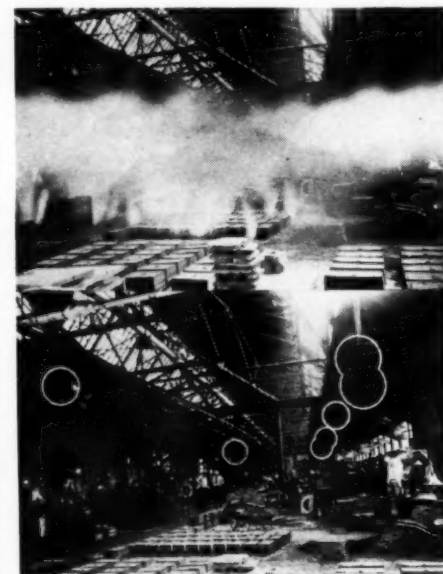
Lighting effectiveness in the plant may be seriously impaired through neglect in cleaning windows, walls and lighting fixtures. The amount of light given out by a fixture or reflected from the walls or ceiling is considerably reduced by dirt and dust. Lighting fixtures should be cleaned regularly, the frequency being determined by plant conditions. These same conditions will also determine the type of fixture to be installed. In clean surroundings permitting the use of an open reflector, dusting alone may be sufficient. When frequent washing is necessary, a snap-on type of reflector unit may save much time. In many cases a fully enclosed fixture will make cleaning easier as only the outside glass surface or lens need be cleaned.

If fluorescent lighting is used, more frequent and greater cleaning care is needed because the relative amount of light deterioration from dirt will be greater with fluorescent than with filament lamps. This is because of the generally higher lighting intensities, the lesser number of lumens per square inch of lamp surface, and the greater number of square inches of lamp surface exposed.

Because inconvenient tasks are most likely to be deferred, the location of the lighting fixtures should be chosen with some regard to ease in maintenance. The primary seeing task must receive first consideration, but as lighting efficiency drops off rapidly with poor maintenance, frequently cleaned units in a slightly inferior location may give better average illumination during the life of the job.

Repeated sight-meter readings will disclose any lowering of lighting intensities. A person familiar with conditions will know at once whether cleaning or lamp renewals are needed, or whether the reflecting surfaces are in bad condition. If, with clean lamps and reflectors, the foot-candle readings are below standards, it is probable that the surrounding surfaces need refinishing.

Clean bright paint has often been called the cheapest way to good lighting. Checking light intensities before and after painting will show the value of fresh paint and permit setting up standards to determine when repainting is again needed. Light colored paints should be chosen for their greater reflecting ability since full



UNIT HEATERS completely eliminate the fog, shown in the top illustration, in two minutes. For fog removal, by-pass dampers are used which permit fresh air to be circulated. Circles in lower illustration show heaters. Note that seeing conditions are back to normal.

MAINTENANCE GUIDE SHEET

ELECTRIFIED PLANT HOUSEKEEPING

Check Sheet

TASK	LOCALE	EQUIPMENT & METHODS	TASK	LOCALE	EQUIPMENT & METHODS
Keep Repairs & Replacements up to the Minute	Fire-alarm response to trouble calls	Keep repair equipment in good working order Have equipment available in portable units ready for instant transport to trouble	Keep Everything in Order (Cont.)	Collection of litter	Plenty of receptacles Receptacles for various types of litter Safe storage pending collection Electric trucks with portable conveyors or lifts
	Keep repair costs down	Have supplies available in portable containers in job units — cut waiting time Keep replacement items scattered strategically about the plant in labeled containers		Increased salvage value	Paper balers Metal balers Oil extractors Magnetic separators
	Notification systems	Check maintenance of call system Independent power source for call system			
Keep Things Clean	Floor—Sweeping	Industrial vacuum-cleaners Dust collectors	Keep Free of Fire & Other Hazards	Explosive atmospheres during maintenance	Explosive-proof equipment Portable blowers
	—Scrubbing	Electric scrubbers Industrial vacuum-cleaners to take up excess liquids		Tank interior cleaning	Blowers—Drive out dangerous fumes Blowers—Supply fresh air
	Clean walls & ceilings	Industrial vacuum-cleaners Power spray-painting units		Shock or accident from wiring	Choose location carefully Keep all wiring clear of working areas Keep passageways clear
	Good lighting	Snap-on fixtures for easy cleaning Convenient fixture location Enclosed lighting units Frequent window cleaning Spray-painting equipment Sight-meter to check lighting High Illumination Levels		Fire fighting	Fire extinguishers designed for electrical and oil fires
Keep Everything in Order	Tools & materials while on the job	Portable truck Tool & supply container	Keep an Attractive Environment	Attractive interior	Orderliness and Cleanliness
	Excess raw and finished material in process	Power or gravity conveyors Power or hand trucks Hoists Chutes		Attractive exterior orderliness & cleanliness night and day	Landscaping Grass plots & drives Parking areas—lighted Direction signs—lighted Traffic guides—lighted
	Orderly store-rooms	Improved lighting Correct paint colors		Protection	Fence and yard lighting Parking area lighting Warning signs Signals Indicator lights
				Advertising	Flood lighting Advertising signs

lighting value is secured only if the greatest amount is directed or reflected toward the areas to be lighted.

Contrast helps make seeing easier. On dark work, backgrounds should be light in color. With light colored work, the backgrounds should be somewhat darker. In choosing paints for benches, machines, tool racks, bins or other working surfaces, give due consideration to the color of the product.

Nothing encourages cleanliness so much as a high level of general illumination. Dirt and refuse gets pushed into a dark corner and out of sight because few workmen prefer to work in an obviously disorderly place. If there are no dark corners, dirt and litter will be properly disposed of more often and more willingly.

To keep repairs and replacements up to the minute and to give fire-alarm response to maintenance calls, the repair equipment must be kept ready for instant use and necessary supplies immediately available.

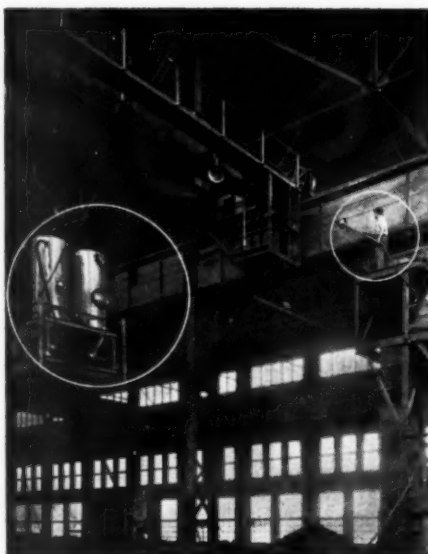
Common sense dictates that the time devoted to a maintenance job shall be only in proportion to its importance. To hold to this schedule, time saving devices such as convenient cabinets and portable chests assist greatly. If the make-ready time is kept to a minimum, the repair job is finished more quickly, and the time charged to the job is kept proportionately low.

For major electrical repairs, the electrical crew will need much in the way of equipment, parts and supplies. If these are stored, in the amounts normally required, in a portable container, they are instantly ready for transport to the location of the trouble, only unusual tools or materials will require special delivery.

Fire-alarm repair service requires immediate access to maintenance tools. After each job they should be checked to be sure they are in working condition before being returned to their places. If not used regularly, they should be tested and overhauled periodically.

An automatic inventory should be in force to see that all tools are returned or replaced. Such an inventory might consist of pictures of the various tools painted on the board where each belongs. Any missing tool is at once evident.

The inventory of supplies should also be checked after each trouble call. Finding himself on the job with insufficient lugs, connectors, wire, or solder means that the electrical man must return to the storeroom and wait for the needed supplies. All such lost time is an increased maintenance charge which may be of very small moment as compared with the production value of the equipment made inoperative for this un-



AS MUCH AS 42 lb. of dust per minute is removed from flat surfaces in this foundry. Over 3,000 lb. in 8 hr. from overhead girders and piping.

necessary time.

For those minor repairs such as replacing a lamp or a fuse, or correcting a bad connection, quick attention is desirable out of all proportion to the seriousness of the trouble. A quick job can be done and much traveling time saved by having cabinets or cribs containing stocks of essential items located at strategic points around the plant.

Quick attention to maintenance requires prompt notice of trouble. Is the plant communications system adequate and has it been checked recently? Power supply for the signal and alarm system should be independent of the normal supply so that power failure will not affect the operation of any alarms.

Hazards

Keeping the plant free of fire and like hazards from electrical causes is partly good maintenance and partly forethought.

In areas where explosive gases may be present, the use of explosion-proof lighting fixtures, motors, controls, and wiring are required. Once installed, all these must be kept in good condition. Care should be exercised when temporary installations are made, or when portable equipment is being used during repairs. If explosion-proof portable repair equipment is not available, temporarily improved vapor conditions can be set up through extremely rapid air change, secured by using oversized blowers.

When tanks or other enclosures are to be cleaned or repaired, caution requires that all possibly dangerous gases be removed before men go in. A portable blower will do this and will also furnish fresh air in adequate quantities for breathing or other purposes.

It seems superfluous to comment on the location of wiring and conduits, yet forethought prevents accidents. Neither temporary nor permanent wiring should be located where exposed parts might cause shock or fire. Keep portable cords out of working areas. Avoid running conduit along or across passageways in positions which might interfere with normal traffic.

Correct types of fire extinguishers should be kept available and freshly charged near those places where electrical or oil fires might occur. Fire authorities will be glad to give advice about this.

An attractive appearance goes with orderliness and cleanliness. This applies to the outside as well as to the inside of the plant. Orderliness and cleanliness inside the plant help make a pleasing environment and is also an aid to morale. Many plants have replaced the common cinder fill with grass plots and gravelled or concrete drives. This has encouraged orderly parking, facilitated movement of traffic, and discouraged the careless disposal of waste and litter. It has also had value as a measure of dust control.

Carefully placed floodlights and guard fence illumination of sufficient intensity will serve as additional outside watchmen, for detection of intruders is made easy. Adequate lighting of the grounds and fencing is considered essential for the prevention of sabotage in war industry plants.

Lighting throughout the parking areas is necessary for the prevention of accident, vandalism and thuggery. In these times when plants are operating two and three shifts daily, workmen go to the parking yard at all hours. They deserve this lighting protection.

Direction signs, warning signs, signals, traffic guides, indicator lights, and all such items should be lighted at night and many of them should be lighted at all times. Depending upon light to attract attention to their message, they accomplish their objectives quietly and add to the appearance of orderliness and cleanliness.

From all of this it is evident that an attractive outside appearance by day and by night has both an aesthetic and a practical value.

Electrified plant housekeeping may be summed up as forethought in providing proper conditions and then maintaining them in proper order by electrical labor-and-time-saving means. Thus we secure the real benefits of good plant housekeeping: elimination of confusion in work, improvement in efficiency, extension of machine life because much of dust and dirt are excluded, cutting down waste and pride in our own job and working place.

Look to

CENTURY MOTORS

*For Continuous
Three-Shift PRODUCTION Duty*

All Century Motors are built for continuous, three-shift, all-out production, and designed to contribute to the top performance of every machine they drive.

Under the pressing demands of war, industry can rely on Century Motors to stand up under continuous 24 hour per day full load conditions.

There's the correct Century Motor especially designed and built for practically every kind of service condition known to industry; in a wide variety of types and sizes from fractional to 400 horsepower.

Century has shortened the time necessary to make shipments of AC and DC motors on war orders. Call in your nearest Century Motor Specialist or write direct now. Our 39 years of experience in building and applying motors to industrial requirements is always at your service—you may find this particularly valuable.

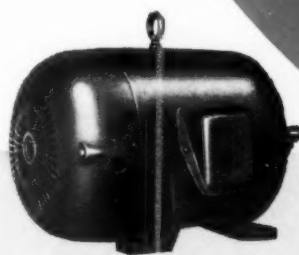


CENTURY ELECTRIC COMPANY

1806 Pine Street, St. Louis, Mo.

Offices and Stock Points in Principal Cities

One of the Largest Exclusive Motor
and Generator Manufacturers in
the World.



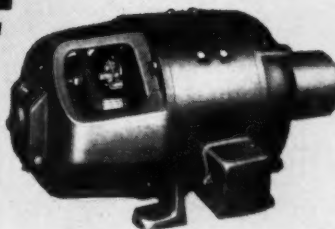
▲
Century Totally
Enclosed Fan-
Cooled Motor for
surroundings
hazardous to
ordinary motors.



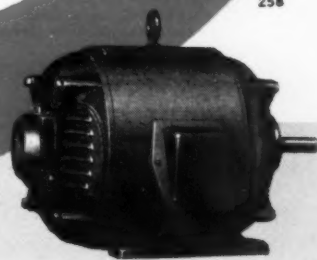
▶
Century Open
Rated General
Purpose Motor.



▲
Century Splashproof
Motor protects against
splashing liquids and
falling solids.



◀
Century Direct
Current Motor for
all DC applica-
tions.



▲
Century Repulsion
Start Induction
Motor for hard-to-
start loads.

258

Two Good Rules to

RULE No. 1—ALWAYS USE

"INCH-MARKED"

PAT. APPLIED FOR

ELECTRUNITE Steeltubes

REG. U. S. PAT. OFF.

RULE No. 2 —is a good rule, too—a foot-rule clearly printed on every length of "Inch-Marked" ELECTRUNITE STEELTUBES. From end to end, every inch and foot is clearly marked for you.

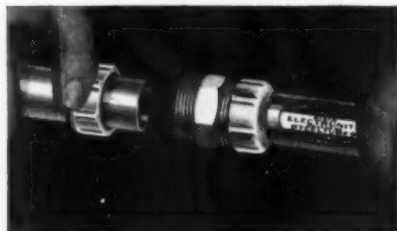
You can forget your pocket foot-rule for most of your work. You can save the trouble of opening it up and putting it away every time you want to measure off for a bend or cut length. You won't have to juggle a foot-rule on a piece of tube while making a pencil mark. The mark for cutting or bending already is made for you—and made accurately.

Your work will be easier—with less chance for error and wasted material lost through off-size bends and short lengths.

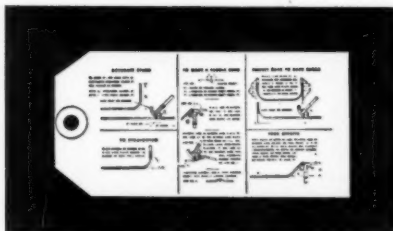
"Inch-Marked" ELECTRUNITE STEELTUBES will bring you other toil-saving advantages. You'll have no

threads to cut—no long lines to turn. Two simple compression-type fittings make tight joints a simple matter. Light weight saves aching arms and backs. The ELECTRUNITE Bender simplifies bending by hand and the bending instruction tag tells you how. The patented knurled inside finish makes wire pulling as much as 30% easier.

"Inch-Marked" ELECTRUNITE STEELTUBES is fully approved for exposed, concealed or concrete slab construction. Any U. S. Government agency can use this material by requiring that it conform to the *emergency alternate* — E-WW-T-806a — for Federal Specification WW-T-806 which is similar to the 1940 National Electrical Code. Try it on your next job. See why it is called the "easiest-to-use rigid steel raceway in the world." Steel and Tubes Division, Republic Steel Corporation, Cleveland, Ohio.



You don't have to "steam-fit" ELECTRUNITE STEELTUBES. Two simple compression-type fittings end tiresome, dirty thread cutting.



The new bending tag, supplied with each shipment of tubing, provides simple instructions and diagrams for making various bends.



With this new ELECTRUNITE Bender you can make any standard bend more accurately and with less effort than ever before possible.



to SPEED Construction for Victory

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ON FOOT-RULE ON EVERY LENGTH

8 9 10 11 12 15



YOUR ELECTRUNITE DISTRIBUTOR WOULD RATHER SAY "YES"

Your ELECTRUNITE Distributor wants to help you in every way possible. That's why he carries a complete line of dependable electrical supplies. But, because of the present emergency and the demands of National Defense for the materials he handles, he may have to say "NO" to some of your requests when he'd rather say "YES." See him first. Tell him what you need and where you want to use it. He'll do everything in his power to help you keep schedules moving.

Motor Breakdowns Prevented by Use of Rapid Air Drying Insulating Varnish!

NEWARK, N. J.

Motors burn out when the original insulation fails.

One of the slow acting factors contributing to insulation failure is decreased insulation resistance which can be attributed directly to the aging of varnish insulation.

This slow and silent attack on insulation is often aided and abetted by the breaking down action on varnish film caused by direct and indirect contact with acids, oil, moisture and dirt.

HOW TO PREVENT MOTOR BREAKDOWN

The original insulation of motors, generators and other electrical equipment may be renewed and their life prolonged by the application of a coat of DOLPH'S ELECTRIC LACQUER to windings at regular intervals.

FAST DRYING MEANS QUICK RETURN TO SERVICE

ELECTRIC LACQUER, easily applied by brush or spray, air dries in 30 minutes and its use will not seriously interfere with production for equipment need not be shut down except during the application.

A single coat of ELECTRIC LACQUER seals holes, fills cracks and heals defects which may have developed in original insulation. The tough, black glossy film of ELECTRIC LACQUER presents a surface to which dirt and dust will not readily cling. The excellent resistance to acid and oil attack and waterproofness offered by ELECTRIC LACQUER make it particularly suited for use in the textile, chemical processing and steel industries.

FREE—Working sample of ELECTRIC LACQUER furnished on request.

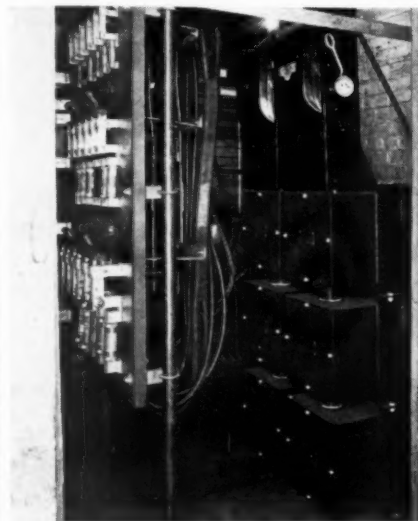
JOHN C. DOLPH COMPANY
168A Emmett Street Newark, N. J.

ADV.

Capacitors Release Feeder Capacity

The main electrical load, at the plant of the Iron Fireman Company, Cleveland, Ohio, consists of machine tools. Because the motors have an inherent low load factor they created a low power factor condition that was responsible for an excess power demand charge.

A total of 157½ kva. of capacitors was placed at the electrical distribution



TO CONSERVE SPACE, the capacitors and their disconnect switches installed at distribution points, are mounted on the wall back of the distribution board.

centers, and they raised the operating power factor from 70 per cent to a near unity value of 97 per cent. Valuable feeder capacity that formerly was unavailable because of wattless current has been released and the monthly power bills reduced by six per cent.

Ideas on Small-Motor Operation

Every plant is interested in getting the best use of its machines and motors. Proper application is therefore important—whether there's one motor in use, or fifty. Here are ten ideas on modern small-motor practice taken from a number of plants.

1. Don't Waste Power

With modern pivoted-base drive, correct belt tension is established when the motor is installed, and the weight of the motor maintains this proper tension at all times, reducing power loss due to belt slippage.

2. Speed-up Production

Foot-operated motor control keeps the worker's hands free and speeds up production.

3. Cut Maintenance Costs

You can be sure of satisfactory motor

For Best Results Use PAINE Self-Locking TOGGLE BOLTS



Note how wing edges engage bolt when wings are spread. This clamping action prevents bolt from working loose after it is tightened.

TO FASTEN

- Conduit Clamps
- Cable Clamps
- Pipe Strap

TO HOLLOW MATERIAL

Cable and Conduit jobs as well as Pipe Strap installations can be handled faster with better fastenings to Lath and Plaster, Wood, Tile, Machalite, Sheet Rock, and Gypsum with PAINE Self-Locking, Spring Wing Toggle Bolts. Wings compress easily when pushed through bolt hole, and each wing springs to an anchoring position assuring a permanent fastening where either one or both wings can be spread. Available in 9 different head styles—in standard lengths and standard diameters from 6-32 to ½" to meet all requirements.

PAINE TOGGLE BOLT CLAMP



LOOK FOR THIS CLAMP IN YOUR NEXT BOX OF PAINE TOGGLE BOLTS



WORKS TWICE AS FAST

A simple, positive, foolproof device that is saving electricians hours of tedious, finger-wearing labor. It slips easily over bolt thread and holds toggle tight against inside of wall, floor or ceiling so bolt can be tightened with a screw driver.

Ask your Supplier TODAY for PAINE Spring Wing Toggle Bolts and get a clamp FREE.

THE PAINE CO.

2961 CARROLL AVE., CHICAGO, ILL.
New York Warehouse & Sales: 48 Warren St.

operation where dust, lint, or sawdust are prevalent, if you use totally enclosed, fan-cooled motors.

4. Trouble-Free Operation

Trouble-free motor operation can be assured by definite, scheduled inspections, with an index card for every motor which gives complete information on lubrication, cleaning, inspection of brushes and commutators, etc.

5. Safety First

"Undervoltage protection" prevents accidents which might result from equipment starting of its own accord after a temporary power shut down.

6. Save Space

Valuable floor space can be utilized for production by mounting a motor on the wall or ceiling.

7. Avoid Delays

When a machine is temporarily overloaded, modern "overload protection" will prevent costly interruptions usually caused by delays in replacing a blown fuse.

8. Help Employees See

You can eliminate frequent dimming of lights by making sure that all motors are on a separate power circuit and not on the plant lighting circuit.

9. Machines Where You Want 'Em

Conveniently spaced ceiling or wall power outlets, and equipping of light-duty machines with flexible cords for power supply, make possible rapid rearrangement of your production.

10. Suit Motor to Job

Motors of the proper capacity for the particular load will operate at better power factor and at higher efficiency. Have you checked up on the motorization of your equipment?



INFRA-RED LAMPS heat a cold spot in shipping room of the Kansas City Smelting Company. With this low cost spot heating the packer did not have a cold during an entire winter.

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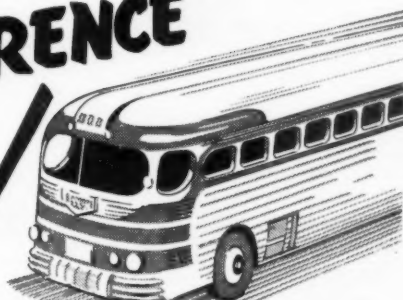
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Reader's QUIZ

QUESTIONS from readers on problems of industrial equipment, installation, maintenance and repair. Answered by electrical maintenance engineers and industrial electrical contractors out of their experience. For every question and every answer published, we pay \$5.00.

MONEL WIRE CAPACITY

QUESTION 37. What is the formula for determining current carrying capacity of monel wire and busbar operating at 1000° F.? According to the Electrical Handbook, monel conductivity is 4 per cent of copper. This being so, please state how one manufacturer of heating units gives 10 amperes for No. 14 wire and 30 amperes for ½-in. by 0.032 busbar. This carrying capacity is apparently based on about 50 per cent of copper.—J.A.H.

A. TO QUESTION 37. If the conductivity of monel wire is 4 per cent of that of copper, the resistance would be 25 times that of copper. If you wish to use monel metal and have the same heating effect as you have with copper wire of the same size, the current allowable would be one-fifth, since the heating effect is proportional to the square of the current.

If the wire is used as a heating element rather than simply a current-carrying conductor, we would increase the current until we have the desired heating effect. For example, you state that the No. 14 wire is listed as carrying 10 amperes. Heating with 10 amperes would be 25 times that of copper wire of the same size carrying the same current.

Apparently this unit is to be used either as a resistance unit to cut down the voltage or as a heating unit to turn the electrical energy into heat. In either case, the higher resistance is desirable and the current to be carried will be determined by the amount of heat and the safe operating temperature of the metal rather than by the conductivity.

In this case, this safe temperature is apparently 1000° F.—J.E.W.

A. TO QUESTION 37. The solution to the question will be more easily understood if we consider monel as an electrical resistance alloy, for the purpose of converting electrical energy to heat energy, and do not try to compare its characteristics to that efficient electrical conductor copper. No doubt the rating in amperes, as given by the manufacturer, is for the purpose of designing the resistor with a certain watts per sq.in. density. Consider the No. 14 gage wire with its rating of 10 amperes to operate at a temperature of approximately 900° F. According to a published table the maximum working temperature of monel is about 800° F. Perhaps this will help you understand the current rating as published by the manufacturer.

I used the following formulas in conjunction with some graphs on radiation from black-body surfaces.

$$R = \frac{l \times r}{A}$$

R = resistance at 20°C.
l = length
r = specific resistance
A = cross section

$$Rt_2 = Rt_1 [1 + a (t_2 - t_1)]$$

Rt₂ = resistance at t₂
Rt₁ = resistance at 20°C.
a = temperature coefficient

$$\frac{\text{Watts} = I^2 R}{\text{Surface Area (sq. in. per ft. of length)}} = \text{Watts per sq. in. density}$$

$$\frac{\text{Watts per sq. in.}}{\text{Emissivity factor}} = \frac{\text{watts per sq. in. black body radiation}}{\text{body radiation}}$$

Temperature of wire taken from a temperature and watts per sq. in. graph.—V.M.

A. TO QUESTION 37. Monel metal (according to a text table) has a specific resistance of 257

at 20° C. and a temperature coefficient of .00206. On this basis, calculations show that No. 14 B & S which is equivalent to 4106 circular mils in area, has a resistance of .0627 ohms per unit length. The monel bus ½ in. by .032 in. is equivalent to approximately 20380 circular mils. It has a resistance of .0126 ohms per unit length. The manufacturer found, most likely by experiment, that 10 amperes under a given condition would produce an operating temperature of 1000° F. from the No. 14 wire. The monel bus, although five times larger in area and but one-fifth of the resistance cannot carry a current five times larger. Its temperature would probably rise to a melting point, because it varies as the square of the current.

If no data is available, the following formula which has been derived from the constants; 10A for No. 14 and 30A for the bus, may be used.

$$Cm = I \left[11 I (\log I) + \left(\frac{300}{\log I} \right) \right]$$

Cm = circular mil area of conductor
I = current

This formula is not linear, it conforms more with the exponential function type and may be useful in determining the circular mil area of any shape monel conductor for a desired current within practical limits. In addition, for general purpose, if three or more values of current are plotted as a function of circular mil area on rectangular coordinates, an adequate graph is obtained. In comparing copper conductors with monel, it may be observed that conductivity does not necessarily determine the current.—O.A.

LOW INSULATION RESISTANCE

QUESTION 38. I have a 5 hp. 220-volt motor operating in a damp place in a creamery. The insulation resistance to ground has dropped to .4 megohms (400,000 ohms). The motor operation is normal. Should this motor be taken out and rewound?—C.L.B.

A. TO QUESTION 38. Take this motor to a reliable motor shop unless you have the necessary equipment. First bake the motor out at approximately 225-250° F. for 10 to 12 hours. Allow it to cool and repeat the megohmmeter reading. If it has shown improvement continue with this baking process until about another six hours has passed, then dip it in a good grade of insulating varnish and allow it to soak up all that it is able. Then bake it for another 10 hours at 250° F. After

it has had three dips and is thoroughly baked there remains very little room for moisture and it will last longer in such a damp place.

Of course, if the motor megohmmeter reading does not show improvement after 12 to 18 hours of baking its cell insulation is probably destroyed and a rewind will be the only thing to bring it back.—F.A.F.

A. TO QUESTION 38. It would not be necessary to rewind the motor. Since the question indicates the resistance has dropped rather suddenly, an inspection of the winding may show up the cause. If it is dampness, which is likely, the winding should be dried.

Sometimes motors operating under similar conditions intermittently have low insulation resistance and it is very hard to keep it high. Such cases should be tested and inspected frequently. All sudden dips in the resistance curve should be investigated and the cause removed.

Many engineers use the minimum allowable value of one megohm for apparatus rated at less than 1000 volts. The Hartford Steam Boiler Inspection & Insurance Co. insist on this minimum. The A.I.E.E. and A.S.A. formula:

Minimum Insulation Resistance in Megohm =

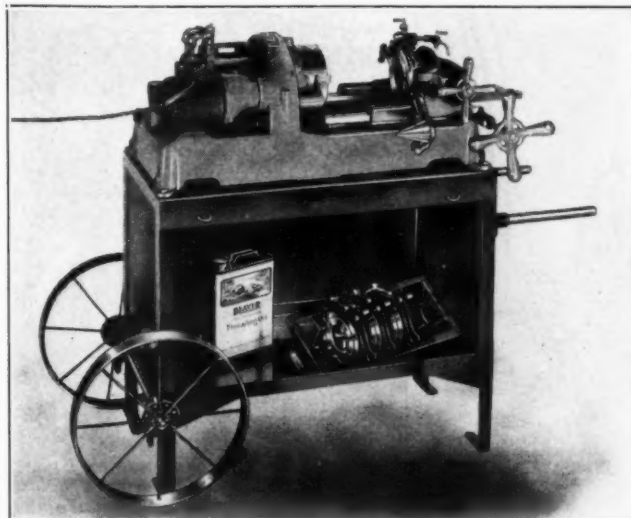
$$\frac{\text{voltage}}{\text{kva} + 1000} \\ 100$$

will give a value lower than 400,000 ohms, which indicates that the motor is still safe. However, it is still good practice to maintain a minimum of one megohm.—J.A.H.

A. TO QUESTION 38. Try baking for 24 hours. At the end of the baking period take a megohmmeter reading and if your reading has risen near the standards set by your shop, give it a thorough painting with a good grade of insulating varnish or better yet dip the motor right into it. The temperature of the baking process should not exceed 180° F. After assembling and mounting the motor, place a hood of tin over the motor enclosing all sides, the only openings being the slots for the motor shaft and conduit, which should be as small as possible.

This method was used successfully on four motors operating in wet surroundings. An oven may be readily constructed, the important thing is the lining which may be asbestos or ordinary boiler bricks. The method we used to heat the oven was several strip heaters placed at the bottom. The motor was blocked up to give air space between the heaters and the motors.—A.W.B.

A. TO QUESTION 38. There is no immediate danger to your motor. However, I would suggest that



Beaver Model-B

1/8 to 2-inch Pipe and Bolt Machine

For 1/8 to 2-inch pipe—1/4 to 1 1/2-inch bolts. Up to 8-inch with drive shaft and geared tools. Rack-and-pinion feed. Cast steel-iron base and cap. All-steel geared universal pipe chuck—with safety automatic wrench ejector; hinged full-range reamer; sliding wheel or knife cutoff; ring-type opening adjustable diehead—no hinge. Automatic gear-driven oil pump. All gears enclosed and run in oil. Choice of 110 or 220 volt universal reversible motor. Weighs about 280 lbs. In use in finest pipe shops throughout the country.

Write for Bulletin B.

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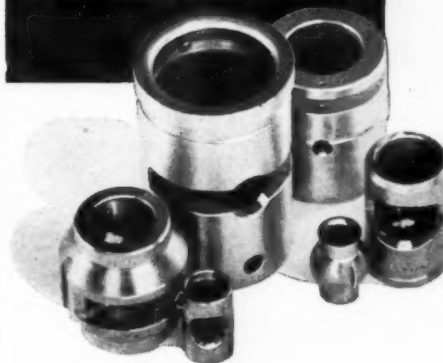
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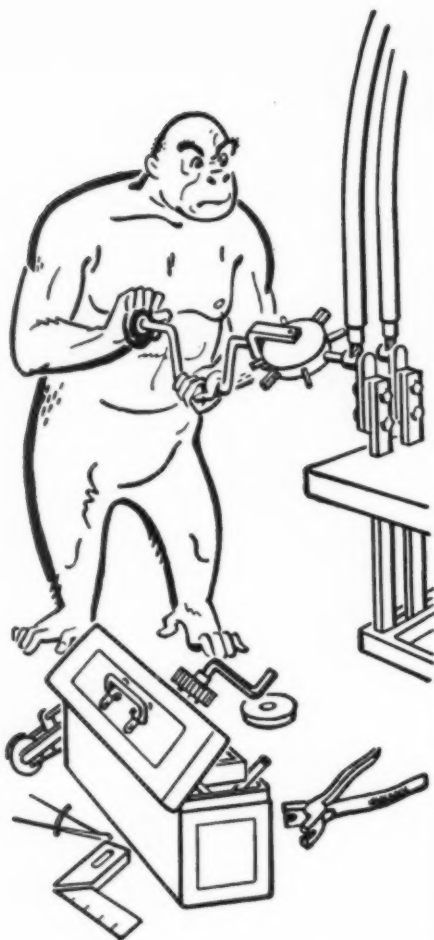
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Special Tools and Gadgets aren't necessary if you use National Electric "Gorilla Grip" Connectors.

Pliers or standard wrenches are all that are necessary to make a tight, positive connection when "Gorilla Grips" are used. And to make them even more convenient and easier to handle, National Electric has assembled stock sets to meet your particular needs and to suit your plant requirements. Write and ask for particulars.



National Electric
PRODUCTS CORPORATION
1000 FULTON BUILDING, PITTSBURGH, PA.

Reader's QUIZ

[FROM PAGE 63]

you bake the stator of this motor at approximately 200° F., long enough to get a constant reading at one hour intervals. Though they may vary slightly, about four readings will be enough. The preliminary baking before testing should be about ten hours. After baking and while still hot, dip or spray the winding with a good grade of baking varnish and bake again for the time recommended by the varnish manufacturer. The above procedure, I have found, will eliminate the necessity of rewinding in most cases.—M.H.

Can You ANSWER these QUESTIONS?

QUESTION R1.—In adding a single phase transformer to close the delta on two other power transformers connected open delta, how can I find the proper way to connect the leads to the bus when the polarity of the new transformer is unknown? The present transformer are additive polarity. Primary voltage is 7200, secondary 480 volts and all three are rated at 100 kva. capacity.—J.J.L.

QUESTION S1.—Would it be practical to connect two 220-volt, 3-phase, 60 cycle, squirrel-cage induction motors in series to a 440-volt, 3-phase, 60 cycle circuit? If so, explain or show by diagram such a connection.—W.B.

QUESTION T1.—Can you give a method or formula for quickly estimating to the ratio of average load to connected load for a 10 hp. motor, run eight hours per day for 25 days, assuming average horsepower to load application and normal load variations of machine tool operation?—S.R.M.

QUESTION U1.—A 5 h.p., single phase, repulsion induction motor had proper voltage at the terminals, current would flow in the line, rotor clearance was satisfactory, commutator and brushes were in good shape yet the machine refused to start. It was thoroughly overhauled, but the trouble persisted. Suddenly on pressing the start button it moved and has worked satisfactorily since. Have you any similar experience on this type of motor and what is the cause of the trouble?—F.L.C.

PLEASE SEND IN
YOUR ANSWERS BY MARCH 1

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You'll Find Them in the New
1942

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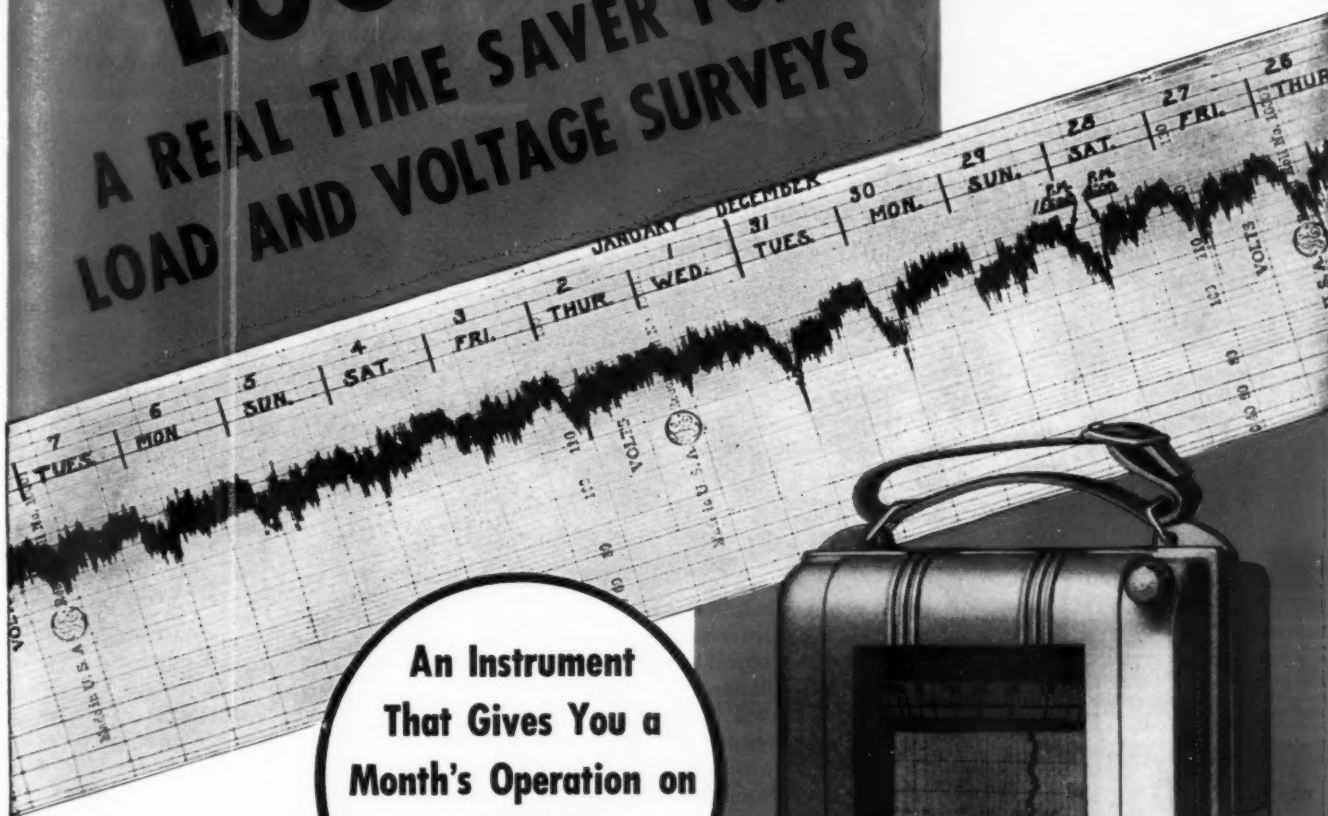
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LOOK!

A REAL TIME SAVER FOR LOAD AND VOLTAGE SURVEYS



**An Instrument
That Gives You a
Month's Operation on
a 30-inch
Chart**

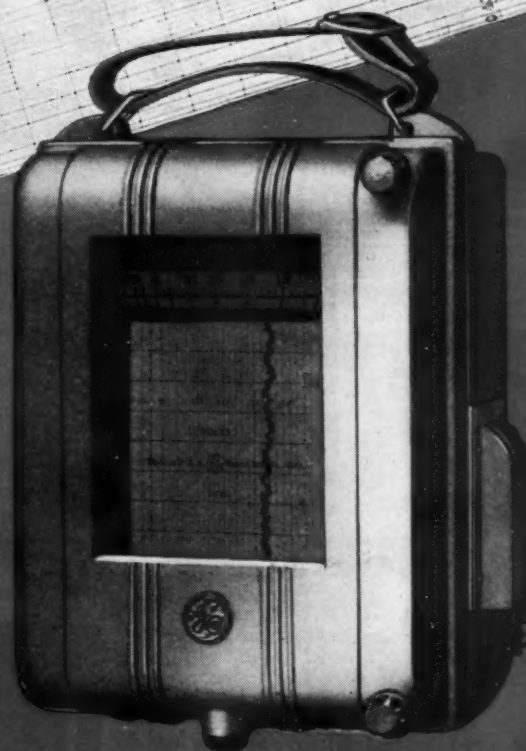
WHEN analyzing load or voltage surveys, it is no longer necessary to reel off 60 ft of strip chart, or to examine a number of round charts. This new instrument gives you a 30-day operating record on a 30-in. chart—thus you can quickly check current or voltage conditions for an entire month, or for any 24-hr period.

A 4-day record can be seen through the glass window. This makes it possible to check the record without opening the instrument and unrolling the chart.

IT'S INKLESS—REQUIRES NO ATTENTION

This new instrument is an addition to our proved Type CF line of inkless recorders. It is the inkless feature that makes possible the one-inch-per-day chart speed. At such a low speed, an ink recorder would form pools of ink that would blot out the record.

The inkless feature also enables the instrument to operate for a month without any attention, because the old troubles of pen clogging and ink freezing or evaporating are eliminated. Accurate



Type CF-1 low-chart-speed recorder
(both ammeters and voltmeters are available)

in extremes of temperature—from -10°F to 120°F .

This instrument will be a worth-while addition to your testing equipment and should soon pay for itself in the time it saves. Bulletin GEA-3187 gives complete information. General Electric Company, Schenectady, N. Y.

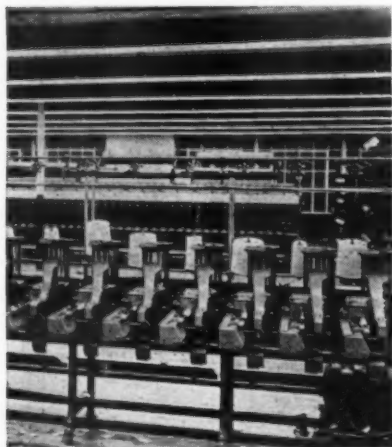
HEADQUARTERS for ELECTRICAL MEASUREMENT

GENERAL  ELECTRIC

Modern Lighting

WINDING FILLING

Filler winders are set up in a room 50 by 152 feet at the Uxbridge Worsted Company, Uxbridge, Mass. The area is lighted by 25 continuous rows of



PRECISION LIGHTING with fluorescent trough units flood the filler winders in this worsted plant with 35 to 40 foot-candles from skein to rack.

Miller Troffers. Each row is made up of 12 four foot Troffer sections—each section using a 40 watt, 48-inch white mazda fluorescent lamp—a total of 300 lamps for the entire area. Rows of units are spaced six feet apart and are suspended four feet average from ceiling by chain running from center of each four foot troffer section. The average ceiling height is 13 feet. Illumination from skein to rack, 35 to 40 foot-candles.

MIRRORS AND COLOR

In clothing stores and other locations involving careful color appraisal, mirrors of standard greenish plate glass may be responsible for complaints in color. Such mirrors absorb more of the deep red light than of other colors.

The reflected light passes through $\frac{1}{4}$ in. of glass twice. Hence, for mazda F lamps, the greatest loss by absorption is in the wavelength in which the lamp output is lowest and colors containing reds suffer. In filament systems the excess of red light permitted this selective absorption.

A ready judgment of the effect of a mirror is made by holding one's hand or colored material in contact with it noting any difference between color appearance of object and its image. In an actual installation the color difference would be noted between backs of suits and the fronts as seen reflected in the mirrors by anyone who could see both parts at the same time.

Solutions are the substitution of water-white (colorless) plate glass mirrors, or the use of partial red filters for mazda F lamps in mirror lighting units. The latter involves a loss of light, however, sometimes requiring additional lamps.

HARMONIZED OFFICE LIGHTING

The architect and lighting engineer joined forces to provide a high level of illumination from fixtures that harmonize with the design and appoint-

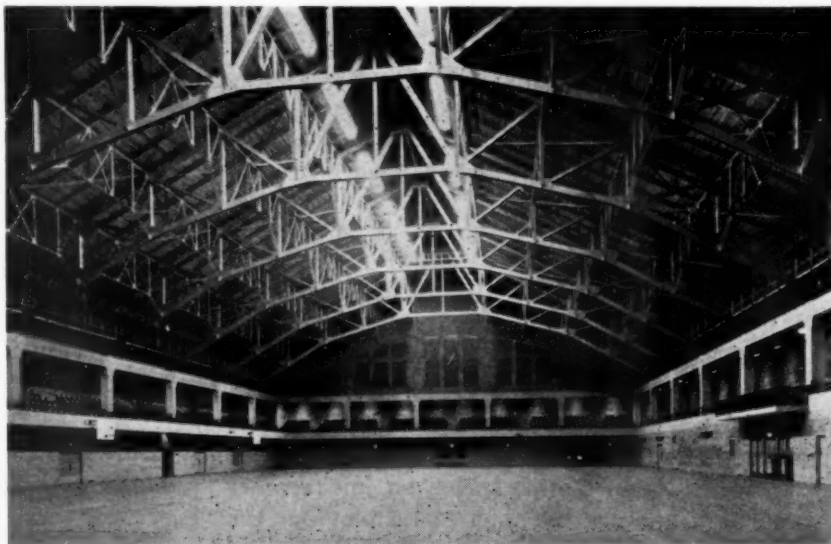


ARCHITECTURALLY BLENDED lighting fixtures provide high illumination levels in the office area of this west coast insurance company.

ments of this general office of the Pacific National Fire Insurance Co., San Francisco, Calif.

Twelve special ornamental Westinghouse Magnalux luminaries with decorative brass rims and cast bronze ornamental hangers were used. The units, which are equipped with 1000-watt incandescent lamps, are mounted 12-ft. above the floor and are spaced on 16- by 18-ft. centers.

The average illumination on the desks, where intermittent reading and writing are done, is 32 foot-candles. This level



LIGHTING AN ARMORY with 25 foot-candles is hardly an everyday sight but the Missouri National Guard has one to show with 36,400 square feet. There are 134 750-watt lamps employed. These are placed in two troughs, mounted 72 feet high and placed over the center of the room. Day Brite equipment with 24-inch Holophane Controlens are employed. The catwalk used for the windows along the sides of the monitor is also used for servicing lighting equipment.

LIGHT THE WAY TO VICTORY



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For Engineering Depts.

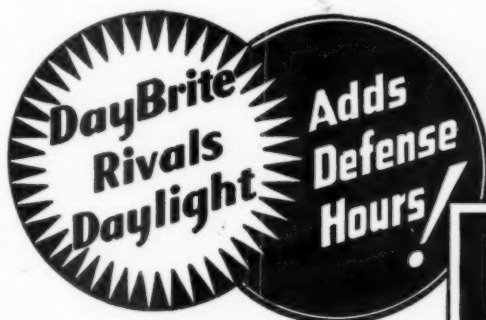
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Factory Lighting of all types—Office and Engineering Dept. Lighting to fit every requirement—single units or long, continuous strips—open and enclosed troffers, recessed or exposed—all engineered to fully utilize the higher efficiency of fluorescent... **SEND FOR CATALOGS** with design illustrations and complete specification data.

*M*AKE every hour count—with Day-Brite Fluorescent Fixtures... They light the way to Victory, from details on the drafting board to accuracy on the production line... They limit eye fatigue, help work to closer standards, insure spoilage reductions, and keep up morale through every hour of a full work week!

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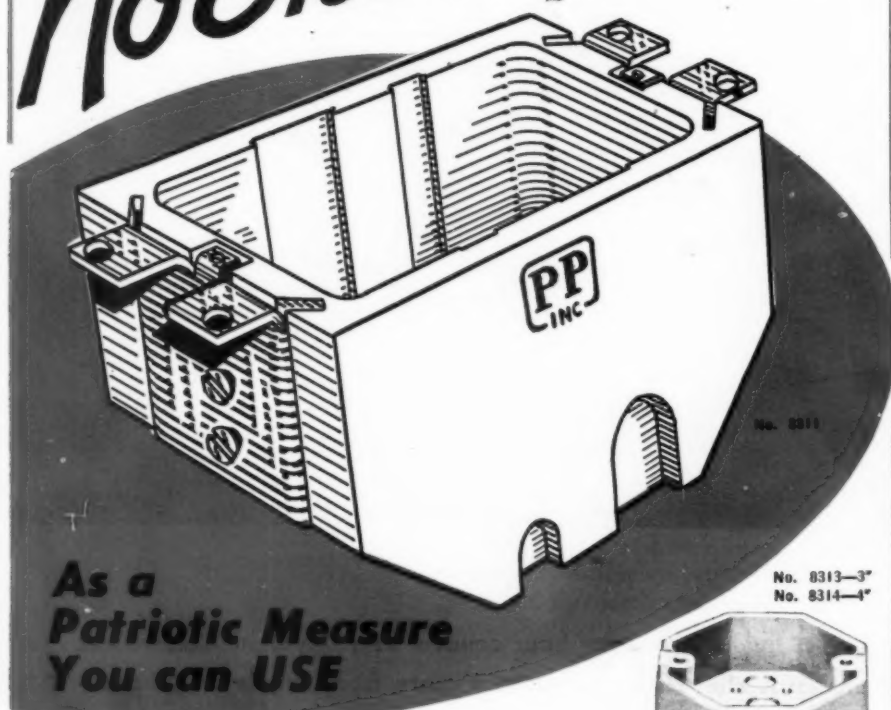
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For Factories, Mills



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For General Offices



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You can USE**

PORCELAIN

**To Conserve
Steel, Zinc, Copper, Rubber**

No. 8318
No. 8318½—Deep



Porcelain Outlet Boxes involve no critical materials—and the Nation needs, for our war effort, all the steel, zinc, copper, and rubber you can save with non-metallic wiring systems. For actual savings, see Porcelain ad on Page 12 of this issue.

Porcelain Outlet Boxes installed with Knob & Tube and Non-Metallic Sheathed Cable Wiring (as listed by OPM) provide for the greatest savings of critical metals.

At low cost, these boxes give superior safety plus long life. Clamps or connectors are out. Porcelain Boxes are corrosion-proof, rust-proof, fire-proof, short-proof, and shock-proof. Standard sizes, spacing, knockouts, etc., provide for the use of standard wiring devices and covers.

Do your part to conserve critical materials for our war effort—Use PORCELAIN Outlet Boxes (for non-metallic systems). Write for literature today.

PORCELAIN PRODUCTS, Inc.
FINDLAY, OHIO

Modern Lighting

[FROM PAGE 66]

is 60 per cent greater than that recommended by I.E.S. as a minimum for such tasks and is more than three times the present national desk top average.

RESISTORS FOR D.C. FLUORESCENT

The operation of fluorescent lamps on d.c. circuits requires a resistance connected in series with the lamp to limit the current flow during normal operation. The amount of fixed resistance required for various lamp sizes is given in the following table issued by the Chicago Division of Electrical Inspection.

TABLE I

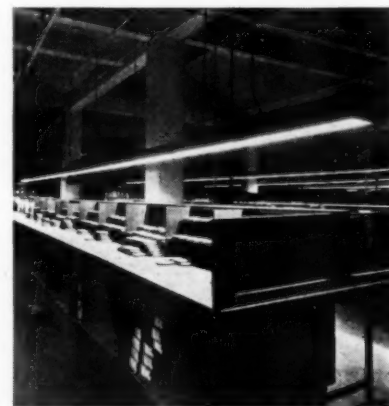
Required fixed external resistance values for d.c. thermal-switch type auxiliaries for 15 and 20 watt, 120 volt lamps or 30 and 40 watt, 240 volt lamps.

Lamp Size	Voltage	Current	External Resistance
T8—18"—15 w	120	.30	198 ohms
T12—18"—15 w	120	.31	190 ohms
T12—24"—20 w	120	.31	144 ohms
T8—36"—30 w	240	.33	*210 ohms
T12—40"—40 w	240	.34	*170 ohms

*For these lamps 2 fixed resistors connected in series are required for each lamp.

FLUORESCENT CIGAR INSPECTION

Inspection and grading of cigars is done under a line of fluorescent light at the plant of the Bayuk Cigar Com-



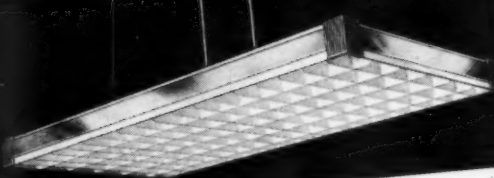
CAREFUL INSPECTION and grading of cigars at Bayuk's Philadelphia plant is done under lines of semi-concentrating fluorescent light. Units are the open, continuous trough type.

pany, Philadelphia, manufacturers of the well known "Phillies" cigars.

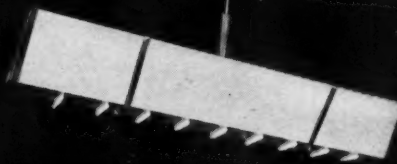
Each grading table is equipped with one 44-ft. length of decorative style, semi-concentrating fluorescent Curti-Strip made up of eleven 4-ft. units

These popular **WAKEFIELD** *Certified Fixtures* can help you lick tough lighting problems!

The Ace. It's tops for high intensity down-light...big help on jobs with poor ceilings.



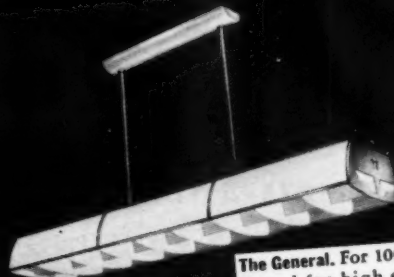
The Beacon. Low-priced, four-lamp unit. Order it from Graybar.



The Grenadier. Popular, two-lamp unit...ideal for suspended troffer use.



The General. For 100-watt lamps. Grand for high ceilings—in both ceiling and hanger mount.



These four WAKEFIELD fluorescent lighting fixtures are helping people in offices and drafting rooms of vital wartime plants to see better and work more accurately. Their popularity and dependability mean more profits—less service costs for you.

Now, because of wartime demands, civilian orders must give way.

We can often give, on high priority

orders, unusually quick delivery. Naturally, we'll do the best we can to take care of your requirements, but deliveries on units for civilian use are definitely slow.

When the emergency is over, you can be sure that WAKEFIELD and its jobbers will still be ready to supply lighting fixtures incorporating all the latest developments in lighting research.

THE F. W. WAKEFIELD BRASS COMPANY

22 Contract Park, Vermilion, Ohio

FOR LIGHTING TO SPEED *VICTORY*

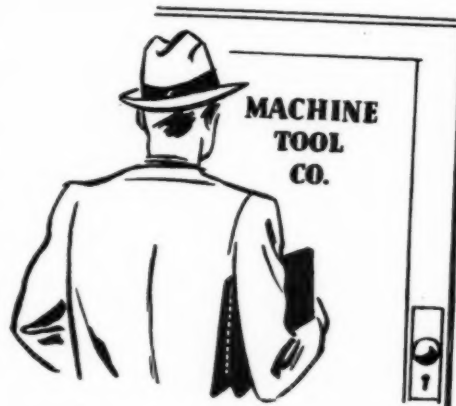


**EVERY CONTRACTOR CAN
HELP HARNESS THE POWER OF
BETTER LIGHT TO AMERICA'S
WARTIME PRODUCTION!**

**SIX SIMPLE STEPS THAT WILL HELP MAKE YOUR BUSINESS A HEADQUARTERS
FOR BETTER LIGHTING FOR AMERICAN FACTORIES AND HOMES**



1 Lay in an ample supply of G-E MAZDA lamps—both filament and fluorescent to serve the growing renewal business. Take advantage of the public preference for products that carry the initials "G-E".



2 Call on the industrial plants—big ones and little ones—in your neighborhood. They need more light and use it longer now they're working three shifts instead of one.

G-E MAZDA LAMPS

AMERICA LOOKS TO —



3 Defense workers ought to have right-size lamps at home to help prevent eyestrain. Use General Electric's new Right Size Lamp Chart when you contact customers—to make sure every lamp you sell is the right size for easier seeing.



4 Consult your G-E MAZDA lamp distributor about stocking Fleur-O-Lier and RLM fixtures for G-E MAZDA F (fluorescent) lamps, tested and certified by Electrical Testing Laboratories, and designed to help produce lighting at highest efficiency.



5 Ask your G-E MAZDA lamp distributor to show you how the ingenious G-E Selectometer can help you demonstrate better lighting. Your customer operates it, chooses the amount of light he likes best—and then you tell him how many footcandles he's picked!

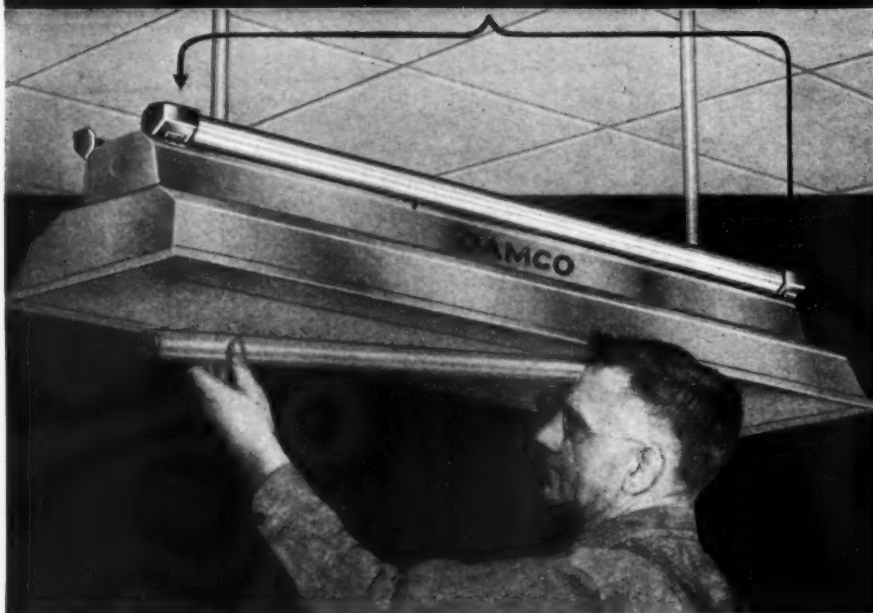


6 Advertise! Put G-E MAZDA F lamp stickers on packages and letterheads. Use hard-hitting direct mail material you can get from your G-E lamp distributor! Use newspaper space! You'll find advertising a powerful aid in establishing yourself as the G-E MAZDA lamp-renewal source.

GENERAL ELECTRIC

NEW LAMP HOLDER

Saves maintenance costs!



CUT TIME LOSSES — MINIMIZE BREAKAGE

An exclusive feature found only on OAMCO Fluorescent Fixtures, is the new Hinged Lamp Holding Device. These cost cutting holders save four out of five "up and down" ladder trips and more than 50% of maintenance working time by holding the lamps either while cleaning reflectors or during replacements. Then, too, they decrease handling which lessens the ever costly breakage hazard.

Attached to the corners of the control housing, these inconspicuous holders fold flush to the sides when not in use and can be instantly snapped into place when needed. If you are putting in a Fluorescent installation, write today for the OAMCO Fluorescent catalog with complete information on these fixtures that save so much and cost no more.



RLM Standard Reflectors

The OAMCO Incandescent catalog illustrates and describes a wide variety of reflectors for every purpose. It includes equipment to meet every requirement for industrial, commercial and institutional lighting, both indoors and out.

RIGHT LIGHT SINCE 1902

OVERBAGH & AYRES MFG. CO.

MEMBER OF THE R L M STANDARDS INSTITUTE

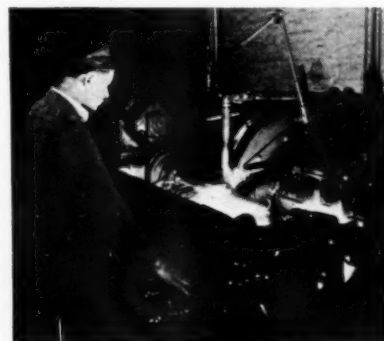
411 SOUTH CLINTON STREET • CHICAGO

Modern Lighting

[FROM PAGE 48]

mounted end-to-end and containing a single line of eleven 40-watt daylight fluorescent lamps. Two-lamp high power factor ballasts are used. Each trough is chain-suspended and fed at one end of the table by a single rigid and flexible conduit connection.

This particular room has nine 44-ft. lengths of continuous trough providing an average intensity of 38-40 foot-candles at the table top.



LOCALIZED LIGHTING aids this grinding machine operator in one of this country's plants doing defense work.

LIGHTING MEAT DISPLAY CASES

Since the inception of the fluorescent lamps they have been used quite extensively in the lighting of refrigerated meat display cases because of the convenience of obtaining high levels of cool foot-candles. While they have proven quite satisfactory, there have been isolated cases reported of an acceleration of the fading of prepared meats such as bologna, summer sausage, liver sausage, boiled ham, etc. Tests, however, reveal that:

1. The speed or degree of appearance change is proportional to the amount of light reaching the meat. The more light, the more change.
2. The speed or degree of change will be practically the same at any given level of illumination, whether the light source be fluorescent or tungsten.
3. The ultimate amount of change is a product of time and intensity; hence changing either factor will change the result.

The Commercial Refrigerator Manufacturers Association in a recent bulletin to their members indicated that after considerable investigation of this subject, they have arrived at the conclusion that there is nothing mysterious

If we're only $\frac{3}{5}$ right

here's the best fluorescent buy

YOU'RE interested, we take it, in getting your client the most light for the least money in the long run.

We say Hygrade Fluorescent Lamps give you that for five reasons:

Because of finer coating texture, which you can see for yourself;

Because Hygrade Fluorescent Lamps give more light—more lumens per watt;

Because they are more even in color—every lamp alike, also obvious to the eye—and an assurance of uniformly high quality;

Because Hygrade lamps are "bright to the last inch"—early end-darkening no longer cuts down the light-casting length of the lamp;

Because Hygrade lamps last longer; tests show demonstrably more life than others; ask Hygrade users and see what they say.

If this were so on only three of these points, or even two, your customer will be money ahead, better off, because he'll get *more light and better light than he can get elsewhere.*

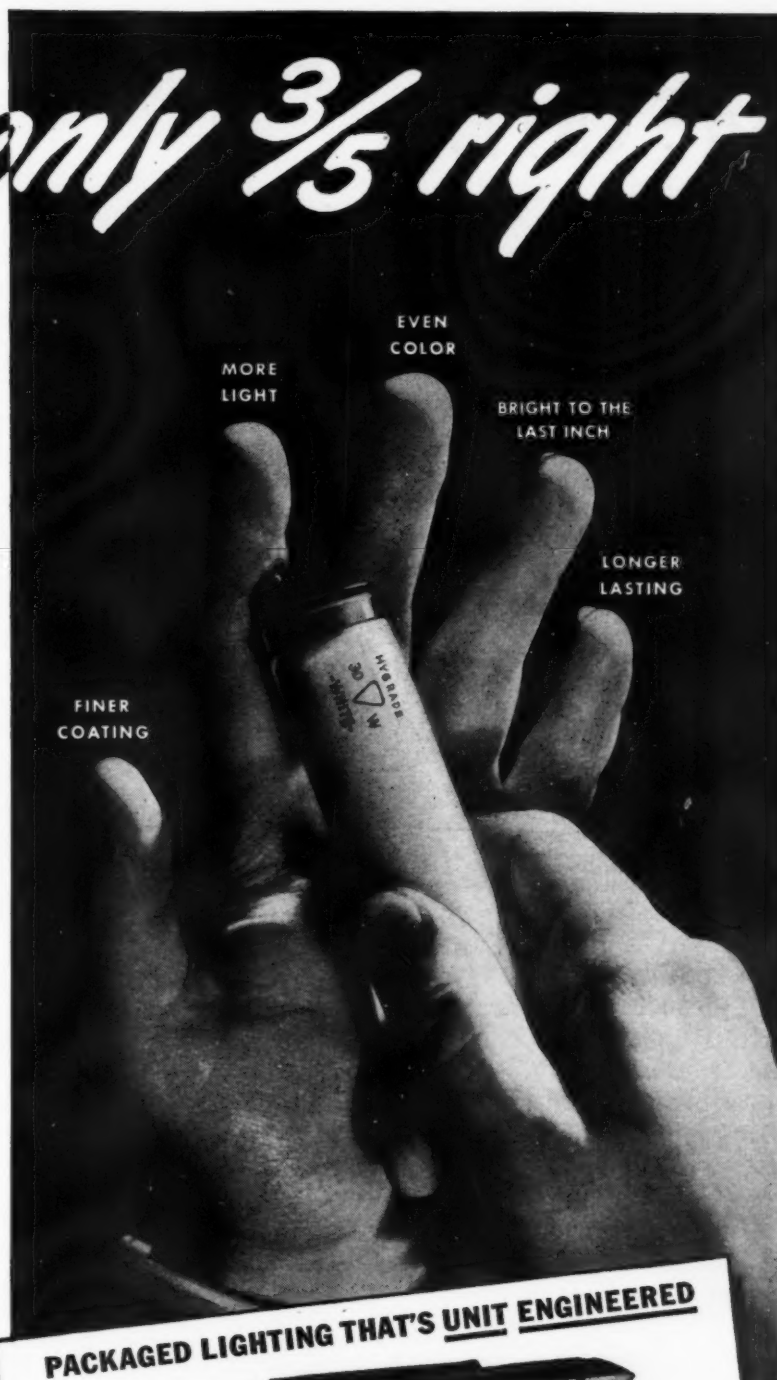
But plenty of Hygrade Fluorescent users say we're right on all five points.

Especially those using Hygrade Packaged Lighting—complete, guaranteed fixtures with all elements unit-engineered to work together—know the superior quality of Hygrade lighting.

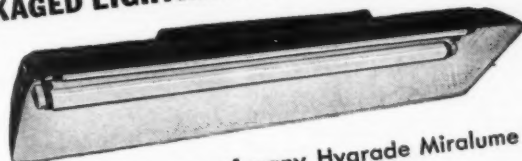
That is "fluorescent at its finest"—*better* lamps in *better* fixtures kept performing at their peak by *better* accessories.

So you'll find it pays to specify Hygrade when you recommend fluorescent lighting. Your client will be getting the best there is—and not a little of the credit will be reflected on you.

If you haven't yet received our free file-size kit—containing catalogs, prices and complete technical specifications on all Hygrade Fluorescent Lighting Equipment—write for it today. Dept. EC2.



PACKAGED LIGHTING THAT'S UNIT ENGINEERED



MIRALUME F-240, one of many Hygrade Miralume fixtures for every industrial need.

Good lamps are the heart of good fluorescent lighting. But good HYGRADE lamps are at their best in this Packaged Lighting that is engineered as a unit. Lamp, fixture,

starter and ballast are designed and built to work together, all held to uniformly high standards—there are no "weak spots" anywhere to limit the performance of any part.

HYGRADE SYLVANIA CORPORATION
SALEM, MASS.

Also makers of Hygrade Incandescent Lamps and Sylvania Radio Tubes

MCGILL



Wood-Handle Guards



4675

McGILL No. 4675 Wood-Handle unit. Made of best-grade steel wire; Hook and Cage, copper-plated. Durable, polished, hardwood handle. Furnished with McGILL Levoller socket.



Series
8000

Popular McGILL No. 8000 Portable Wood-Handle Guard for all-purpose requirements. Construction relieves strain on cord and socket connections. Ten extra-heavy, Bessemer steel wires, electrically welded, cadmium-alloy-plated cages.

McGILL Wood-Handle Guards are providing protection in heavy-duty defense industries. Increased use of wood handles proves their satisfaction as substitutes for rubber. Wood-Handle Guards are sturdy, wash easily without injuring wood handles. For further information visit your wholesaler or write to us.

Electrical Division

MCGILL

VALPARAISO, INDIANA

Modern Lighting

[FROM PAGE 72]

about fluorescent lighting to cause accelerated fading or appearance changes, and that the greater amount of change noticed is due to the higher illumination levels produced in fluorescent

lighted cases and not the type of lamp being used.

The methods recommended for taking care of this condition are:

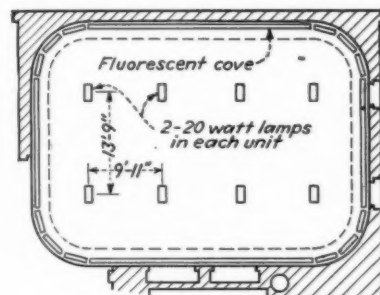
1. Rearrange the contents of the case frequently.
2. Keep the meats which appear to be the worst offenders farthest from the lamps.
3. Rotate the pieces from which cuts are made so as to present fresh surfaces.

Lighting a SPECIALTY SALON *Fluorescent*

PROBLEM—To provide an exceptionally effective and adequate lighting system of good quality in a salon devoted to the sale of women's clothing in a department store.

CONSTRUCTION DATA—The salesroom is 30 by 42-ft. with rounded corners and two cylindrical columns, finished in very light pastel colors.

SOLUTION OF PROBLEM—Combined indirect and direct fluorescent lighting installed. A continuous cove around the room is lighted by a single row of 36- and 48-in. fluorescent lamps fitted on wiring channel. Recessed in the ceiling are eight luminaires with specular Alzak reflectors and glass covers accommodating two 24-in. fluorescent lamps each.



LAYOUT PLAN showing the arrangement and spacing of the lighting equipment.

RESULTS—Direct downlighting provides a soft glareless illumination and the indirect lighting from the cove illuminates the entire ceiling to give a cheerful overall effect.

COMBINATION DIRECT and indirect lighting gives a pleasing yet effective illumination in this department store sales salon.



ANNOUNCING-



A Great New Fluorescent Lamp Starter



THE HYGRADE PREMIUM MIRASTAT

**Automatically breaks lamp circuit when
lamp wears out—stops “flashing”—saves
current—protects ballast—lasts longer!**

THIS remarkable new lamp starter spells great news for all users of any kind of fluorescent lighting equipment!

For the new Hygrade Premium Mirastat Starter is the only standard starter on the market that breaks the lamp circuit when the lamp reaches the end of its useful life, reduces the flow of current through starter and ballast to a negligible point, *and at the same time stops the flow of current through the lamp electrodes!*

It prevents “flashing” of dead lamps—makes group replacements practical—saves current—prolongs ballast, lamp and starter life!

Think what that means in terms of *better production* in plants—where “flashing” lamps may cause annoyance and delay. Think what it means in terms of greater *efficiency* and *economy* everywhere!

Slightly higher in price, the Premium Mirastat supplements Hygrade's regular line of Mirastats—which have the same mechanism, excepting the dead lamp cut-out feature, and are still offered without price premium.

In all Hygrade starters, an exclusive timing device insures positive starting and re-starting—even at low temperatures or high temperatures.

The Premium Mirastat is completely

interchangeable with all standard types of starters—it can be used for replacement as well as in *any* new fluorescent installations.

Anyone who's been bothered with starter troubles will find it the answer to a prayer! Write today for complete information to Dept. MEC 2, Hygrade Sylvania Corp., Salem, Mass.



*At this time of snow and ice
Starting must be most precise!*

All Mirastat Starters are approved by
Underwriters' Laboratories, Inc.

“Everything that's Finest in Fluorescent”

HYGRADE SYLVANIA CORPORATION
SALEM, MASS.

Manufacturers of Hygrade Incandescent Lamps, Fluorescent Lamps and Fixtures, and Sylvania Radio Tubes

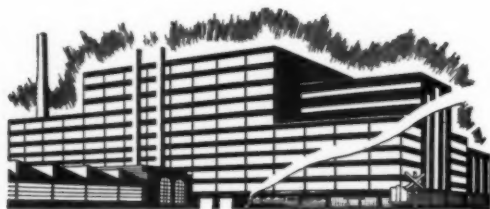
When you Sell..



FLUORESCENT **ANSWERS** to these

What are Certified Fleur-O-Liers?

FLEUR-O-LIERS are fluorescent lighting fixtures made and certified to definite high standards of performance, construction and service.



Who Certifies Them?

Famous, impartial Electrical Testing Laboratories tests random samples of every industrial and commercial design submitted. If the unit tested meets the 50 exacting standards (set up by MAZDA lamp makers for better

light—better service) it is CERTIFIED and permitted to bear the FLEUR-O-LIER label.

Suppose They Are Certified... How Does That Help Me?

You have assurance of strict adherence to features you want and need, such as flicker correction, high power factor (over 85%), ease of maintenance, durability and safety and efficient lighting performance.

What About Ballasts and Starters?

All FLEUR-O-LIER fixtures have CERTIFIED ballasts and starters, which assure reliable, balanced operation and safe, satisfactory service.

FLEUR·O·LIERS

Participation in the FLEUR-O-LIER MANUFACTURERS' program is open to any manufacturer

LIGHTING .. it will pay you to know the QUESTIONS!



Won't I Get This In Any Fixture?

Possibly. But you *can* be sure of these important features when you look for this FLEUR-O-LIER label, because it tells you that the fixture is built to definite high standards.



reliable, continuing performance — not only for wartime's tremendous task but for the long pull ahead.

Who Can Supply Them?

FLEUR-O-LIERS are made by more than 35 leading fixture manufacturers in over 100 different types, sizes and designs.

How Can Fleur-O-Liers Help On "Today's Big Job?"



FLEUR-O-LIERS give you better light to speed production, cut down errors and waste, with easier, faster, more comfortable seeing. They're designed and built to give

**Use Coupon Below
to Get Fleur-O-Lier Booklet and List
of Manufacturers**

GET THESE EXTRA SALES CLINCHERS!

Advertised! Powerful advertising in SATURDAY EVENING POST, TIME, NEWSWEEK and leading trade and business magazines.

Guaranteed! Fleur-O-Liers are not only *Tested* and *Certified* but every unit carries the standard Fleur-O-Lier manufacturer's guarantee.

"50 Standards for Satisfaction" — the new booklet, that shows you the reasons why you'll *sell* dependable fixtures when you *sell* Fleur-O-Liers.



TEAR OUT AND MAIL

Fleur-O-Lier Manufacturers
2122-2 Keith Building, Cleveland, Ohio

Please send me FREE new booklet "50 Standards for Satisfaction," together with list of Fleur-O-Lier manufacturers.

Name _____

Address _____

City _____ State _____

**CERTIFIED FIXTURES
FOR FLUORESCENT LIGHTING**

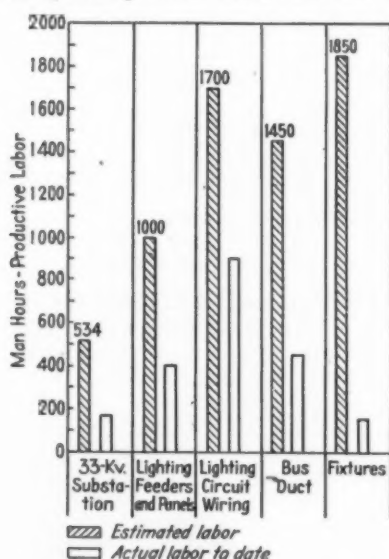
who complies with FLEUR-O-LIER requirements

Estimating

QUICK-CHECK LABOR CHART

Keeping tabs on labor costs is becoming quite a job these days with contractors being as busy as the proverbial bee. Larger and more complicated jobs are coming in every day. To find out just how much labor has been expended on certain parts of individual contracts often entails a lot of time shuffling through numerous estimates and job reports.

The E. J. White Company electrical contractors of Newark, N. J. has developed a simple solution to this problem. The estimator draws up a labor chart for each contract with subdivisions corresponding with those on the re-



LABOR CHART shows at a glance how many man-hours of labor have been used up on any particular job subdivision. Chart can be made as small or large as the particular contract demands.

capitulation sheet of the original estimate. The vertical axis of the chart is divided into productive man-hours of labor. Along the horizontal axis, the job subdivision is indicated. The estimated labor is graphically indicated by a vertical colored bar on the chart directly above the proper subdivision. Actual labor expended on the job to date is indicated by a parallel bar of

different color. The length of this second bar varies as labor units are added from the job reports each week.

The chart is drawn on transparent graph paper to permit blueprinting it if copies are desired by the job superintendent. Thus a graphic record can be kept both on the job and in the office. The original copy is kept in the estimator's notebook with charts of other jobs. Thus, a quick glance at the respective charts reveals the labor status of each job in question.

ESTIMATING GUIDE POSTS

Short method of approximating costs on power jobs are especially valuable today. Many industrial conversion jobs, equipping existing factories for war work are being negotiated on a cost plus fixed fee basis to save time. However, for budget purposes, the contractor is frequently called upon for estimates of reasonable accuracy.

Approximations, which include the average quantities of labor and materials on unit portions of the work are also very useful for checking more detailed estimates, for estimating unit price bids and for preliminary quotations on extra work.

The following tables give detailed estimates from which check figures are derived for motor feeder runs. (Lighting branch circuits were analyzed in October, 1941, *Electrical Contracting*. The figures for motor branch circuits will appear in the March issue).

The conditions assumed in this analysis are a 30-foot run from the service to the power panel and a 100-foot run to the motor. A factor at the bottom of each table provides a means of correcting to any job conditions which would bring the average feeder lengths greater or less than that shown.

The material prices shown are approximate and based upon Mid-west delivery as of July 1, 1941. They should be compared and corrected to your local costs before attempting to

apply the tables. Labor is shown in dollars at the rate of \$2.00 per man hour. To express the labor columns in man-hours, divide by two.

These figures should be used to check estimates only against similar quantities and conditions of installation. There has been no allowance made for insurance, taxes, overtime or supervisions. Check figures, like average labor units are accurate and usable only in the hands of an experienced estimator. Their skillful use, however, can often cut tedious hours of detailed figuring.

Data from A. J. Allyn, Chicago, Illinois.

Table 1

Feeder Load	Feeder Size	Service Switch	4-3 hp. 3 No. 8-3/4-in. 60 amp.	Mat.	Lab.
1	3 Pole Fused Switch		6.25	1.60	
4	Anchors		.10	.52	
3	Fuses		.20		
1	Meter Cabinet		2.75	.72	
4	Anchors		.10	.52	
1	4 Ckt. Power Panel		22.00	2.15	
4	Anchors		.10	.52	
130 ft.	Galvanized Conduit		9.49	2.86	
13	Conduit Supports		.31	.52	
13	Anchors		.33	1.69	
5	Elbows & Couplings		1.35	.95	
4	Locknuts & Bushings		.08	.40	
1	F Condulet & Cover		.23	.17	
1	L Condulet & Cover		.26	.27	
410 ft.	Wire		7.22	2.13	
	Sundries		.10		
Total			50.87	15.02	
Each Additional Foot			.13	.06	

Table 2

Feeder Load	Feeder Size	Service Switch	4-5 hp. 3 No. 6-11/4-in. 60 amp.	Mat.	Lab.
1	3 Pole Fused Switch		6.25	1.60	
4	Anchors		.10	.52	
3	Fuses		.20		
1	Meter Cabinet		2.75	.91	
4	Anchors		.10	.52	
1	4 Ckt. Power Panel		22.00	2.15	
4	Anchors		.10	.52	
130 ft.	Galvanized Conduit		18.20	5.20	
13	Conduit Supports		.64	.65	
13	Anchors		.47	1.95	
5	Elbows & Couplings		2.70	2.05	
4	Locknuts & Bushings		.20	.76	
1	F Condulet & Cover		.43	.29	
1	L Condulet & Cover		1.03	.48	
410 ft.	Wire		11.32	2.46	
	Sundries		.12		
Total			66.61	20.06	
Each Additional Foot			.22	.08	

Table 3

Feeder Load	Feeder Size	Service Switch	4-10 hp. 3 No. 1-11/2-in. 100 amp.	Mat.	Lab.
1	3 Pole Fused Switch		10.75	2.10	
4	Anchors		.14	.60	
3	Fuses		.90		
1	Meter Cabinet		5.00	1.40	
4	Anchors		.14	.60	
1	4 Ckt. Power Panel		38.00	2.70	
4	Anchors		.14	.60	

Contractors

WE'RE DRAFTING

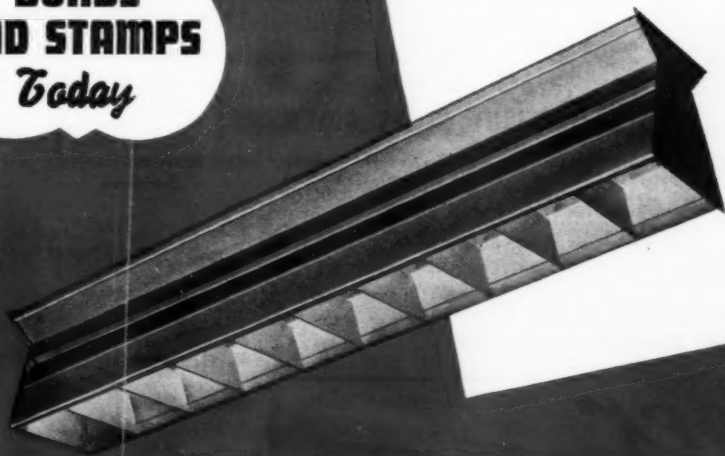
You!



GUARD AGAINST SLOW-UPS IN DEFENSE WORK DUE TO POOR LIGHTING

Light—good light—is essential in maintaining the stepped-up production schedules of our war effort. Twenty-four hour operations demand the best in lighting. Curtis equipment is ruggedly built to stand up in service, carefully designed to save time and trouble in maintenance, brilliantly engineered to deliver as much light as possible and still protect the eyes of the worker from objectionable glare.

Buy
**DEFENSE
BONDS
AND STAMPS**
Today

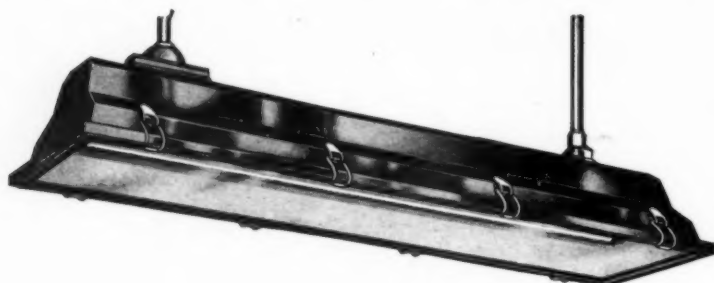


For 100-watt (60") lamp in continuous lines or single sections, Curtis SilverLine is designed to provide high intensity lighting for drafting rooms, offices, and in the plant where tasks require strongly lighted, comfortable surroundings. SilverLine is now furnished with high efficiency Fluracite reflecting surface. Write us for information.

CURTIS LIGHTING, INC.

6135 WEST 65TH STREET • • CHICAGO, ILL.

THE NEW WHEELER VAPOR-PROOF FLUORESCENT LIGHTING UNITS



For Use in Locations where Non-Combustible Dusts and Vapors Exist

Wheeler VAPOR-PROOF Fluorescent Units are made for use in food plants, foundries, and similar locations where it is necessary to protect lamps, sockets and reflecting surfaces from moisture, dust, smoke and vapors.

These units are made for use with 40-watt Fluorescent lamps, and are available in two- and three-lamp constructions.

In locations such as food plants where it is desirable to take extra precaution against lamp breakage, it is recommended that units be equipped with safety sheet glass covers for maximum protection.

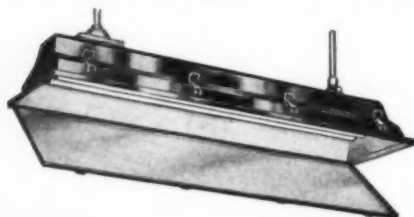
The entire outer body of the reflector, including its closed ends, is enameled in one piece. All sockets and lamp operating equipment are mounted on a wiring channel which is installed through the mouth of the reflector.

The mouth of the reflector has a recessed flange to receive the hinged glass cover which seats against cushioning gaskets to form a moisture and dust-proof seal.

All units are supplied complete with the latest type of ballast equipment employing separate and renewable starter switches. Two-lamp fixtures are supplied with high power factor Tulamp ballasts resulting in an overall power factor above 95% and greatly minimizing any stroboscopic effect. A starting compensator is included in all units.

All units are supplied with hinged suspension fittings which can be swung open upon release of screws, exposing leads for quick and easy splicing. Suspension fittings are tapped for 1/2" conduit.

Fixtures are furnished wired, with leads left for connecting to branch circuit.



HINGED DUSTTIGHT GLASS COVER

The Hinged Dusttight Glass Cover is readily opened for access to lamps or starter switches by releasing toggle latches. Units can be supplied with 3/16" Double Thick Plain Clear Glass, 1/4" Water White Plate Glass, or 1/4" Tempered, Clear Safety Plate Glass.

Distributed Exclusively Through Electrical Wholesalers
Manufacturers of Lighting Equipment Since 1881

Wheeler

REFLECTOR COMPANY

275 CONGRESS ST., BOSTON, MASS.

NEW YORK · CLEVELAND · REPRESENTATIVES IN PRINCIPAL CITIES

Estimating

[FROM PAGE 78]

130 ft. Galvanized Conduit	22.10	6.50
13 Conduit Supports	.88	.78
13 Anchors	.78	2.47
5 Elbows & Couplings	3.65	2.50
4 Locknuts & Bushings	.24	.92
1 F Condulet & Cover	.62	.34
1 L Condulet & Cover	1.31	.57
410 ft. Wire	30.87	4.73
Sundries	.15	
Total	115.67	26.81
Each Additional Foot	.41	.11

Table 4

Feeder Load	4-15 hp.	
Feeder Size	3 No. 2-2-in.	
Service Switch	200 amp.	
	Mat.	Lab.
1 3 Pole Fused Switch	18.25	3.20
4 Anchors	.24	.76
3 Fuses	2.00	
1 4 Ckt. Power Panel	38.00	2.70
4 Anchors	.14	.60
130 ft. Galvanized Conduit	29.90	7.80
13 Conduit Supports	1.12	1.30
13 Anchors	1.27	5.20
5 Elbows & Couplings	5.60	3.30
4 Locknuts & Bushings	.32	1.16
1 F Condulet & Cover	1.87	.43
1 L Condulet & Cover	2.25	.73
410 ft. Wire	44.28	5.90
Sundries	.20	
Total	145.44	33.08
Each Additional Foot	.57	.16

Table 5

Feeder Load	4-20 hp.	
Feeder Size	3 No. 4/0-2 1/2-in.	
Service Switch	200 amp.	
	Mat.	Lab.
1 3 Pole Fused Switch	18.25	3.20
4 Anchors	.24	.76
3 Fuses	2.00	
1 4 Ckt. Power Panel	59.00	4.00
4 Anchors	.24	.76
130 ft. Galvanized Conduit	48.10	10.40
13 Conduit Supports	2.37	2.08
13 Anchors	2.60	5.72
5 Elbows & Couplings	9.65	5.05
4 Locknuts & Bushings	.60	1.76
1 F Condulet & Cover	3.86	.69
1 L Condulet & Cover	4.45	1.17
410 ft. Wire	61.91	7.71
Sundries	.25	
Total	213.52	43.30
Each Additional Foot	.86	.21

Table 6

Feeder Load	4-25 hp.	
Feeder Size	3 300M-3-in.	
Service Switch	200 amp.	
	Mat.	Lab.
1 3 Pole Fused Switch	46.25	5.00
4 Anchors	.30	1.20
3 Fuses	3.40	
1 4 Ckt. Power Panel	59.00	4.00
4 Anchors	.30	1.20
130 ft. Galvanized Conduit	62.40	13.00
13 Conduit Supports	2.63	2.08
13 Anchors	2.60	5.72
5 Elbows & Couplings	19.35	6.45
4 Locknuts & Bushings	.92	2.20

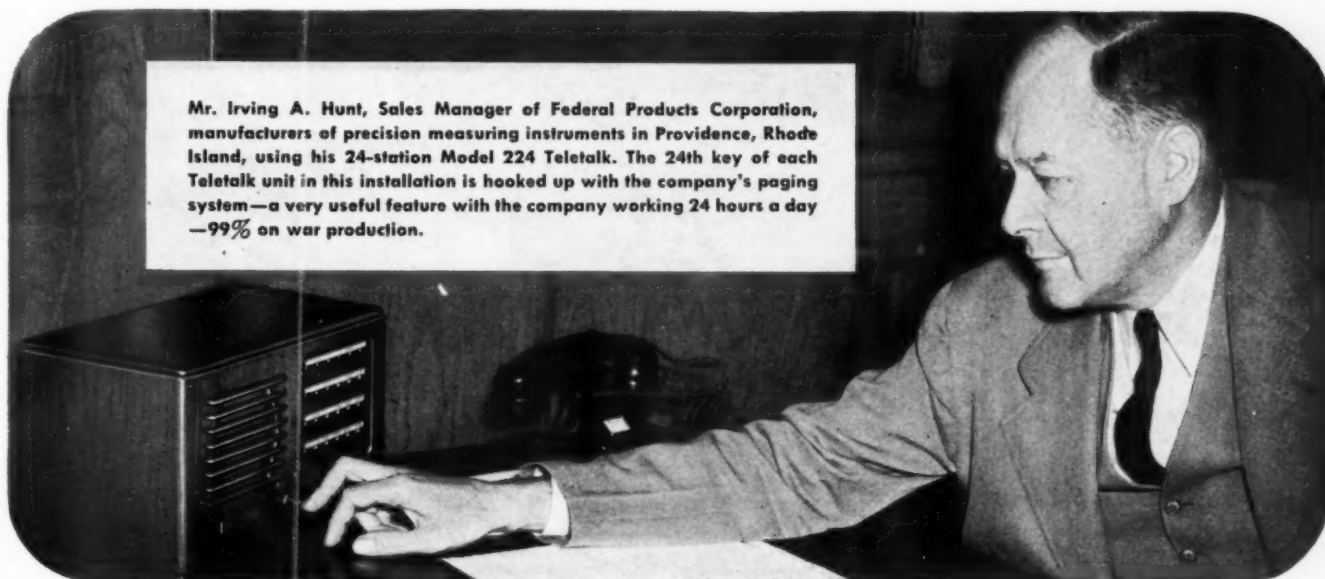
"Webster Electric's reliability is a by-word..."

"Your product has our unqualified endorsement..."

"The installation has proved most worthwhile."

—FEDERAL PRODUCTS CORPORATION

Mr. Irving A. Hunt, Sales Manager of Federal Products Corporation, manufacturers of precision measuring instruments in Providence, Rhode Island, using his 24-station Model 224 Teletalk. The 24th key of each Teletalk unit in this installation is hooked up with the company's paging system—a very useful feature with the company working 24 hours a day—99% on war production.



No Wonder *this* Sale was made with little trouble!

The need is for speed—and one of the most direct, effective answers to that need is Teletalk Amplified Intercommunication. Add to that Teletalk's top notch reputation and you'll know why alert dealers and distributors the country over are letting Teletalk sell itself.

You can sell jobs like this one by showing businesses of every kind how Teletalk saves *time*—today's scarcest raw material!

At Federal Products Corporation, 24 Teletalk units keep management and department heads, plant and office—in instant touch with each other day and night. The switchboard is relieved of the heavy load of inside calls... better telephone service results.

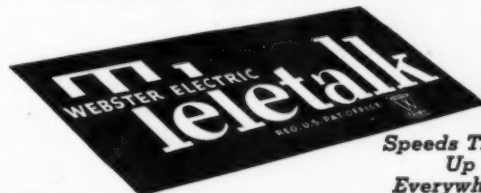
Remember, Teletalk is available in a wide range of prices and models, to meet every intercommunicating

requirement in homes, stores, offices, as well as in manufacturing establishments. Capacities from 5 to 24 stations, with such features as confidential handsets, "busy signals," and many others.

If your jobber does not handle Teletalk, write us.

Licensed under U. S. Patents of Western Electric Company, Incorporated, and American Telephone and Telegraph Company and under Bank Patent No. 1,922,415

WEBSTER ELECTRIC COMPANY, Racine, Wisconsin, U.S.A.
Established 1909. Export Department: 100 Varick St., N. Y. C.
Cable Address: "ARLAB" New York City



*Speeds Things
Up...
Everywhere!*

WEBSTER



ELECTRIC

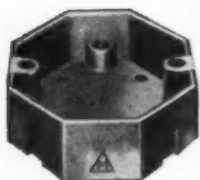
"Where Quality is a Responsibility and Fair Dealing an Obligation"

MANUFACTURERS OF TELETALK INTERCOMMUNICATION AND PAGING SYSTEMS • POWER AMPLIFIERS AND SOUND DISTRIBUTION EQUIPMENT • RADIO PHONOGRAPH PICKUPS • IGNITION TRANSFORMERS AND FUEL UNITS FOR OIL BURNERS

ILLINOIS

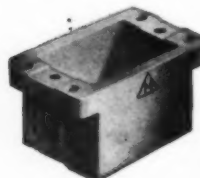
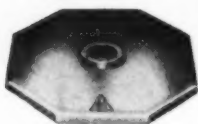
ALL PORCELAIN WIRING SYSTEMS...

are Designed
FOR AND BY
ELECTRICAL
CONTRACTORS..



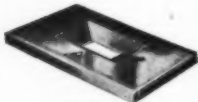
OUTLET BOXES

Glazed and unglazed styles conforming to all existing standards for dimensions, spacing, position of knockout holes and mounting screws. High mechanical and electrical efficiency.



SWITCH BOXES

Insure greater safety in wiring and the elimination of all grounding hazards. Made of best quality white porcelain. Metal inserts are placed in two holes of the switch boxes for receiving screws of standard switches, plugs, outlets, etc. Knockouts for single wires, also for cables. Specify and use them.



STANDARD TUBES

In sizes 1/2 to 48 inches, 5/16 to 3-inch diameter in following types; unglazed glazed, split, floor, split-floor, headless, curved end, crossover split, and crossover. Diameter all uniform both inside and outside.



KNOBS

Cement coated—nail—genuine leather-washer—code standard. They don't chip when driven in and they stay in place.

Illinois All Porcelain Wiring Systems give the contractor an opportunity to install a safe system quicker and better. One that is more adequate and insures permanency. It is the ideal system for practically all residential, commercial, and industrial needs and is particularly dependable where dampness and fire hazards are prevalent. Grounding is unnecessary when you use this system—no rusting or corrosion troubles are experienced. For that very next job make the installation with modern Porcelain.



TOGGLE SWITCH PLATE

All porcelain with beveled edge and decorative pattern on face.



CLEATS

Standard one, two, and three-wire types.



ILLINOIS
ELECTRIC PORCELAIN CO.

Macomb

Illinois

ILLINOIS
...FOR TOP QUALITY

Estimating

[FROM PAGE 80]

1	F Condulet & Cover	6.42	.86
1	L Condulet & Cover	5.80	1.49
410 ft.	Wire	87.74	9.35
	Sundries	.30	
Total		297.41	52.55
Each Additional Foot		1.16	.24

Data from A. J. Allyn, Chicago, Illinois.

More Gossip

New Sanborn Administration

G. M. Sanborn, who recently rounded out a half-century in the electrical contracting business, has delegated the management and direction of the Sanborn Electric Co. of Indianapolis to his business colleagues, O. F. Wadleigh, H. W. Claffey and A. A. Hackman, as president, vice-president, and treasurer respectively. While Mr. Sanborn continues his active interest in the company, the new regime will permit him to enjoy more frequent trips to his favorite Florida resort.

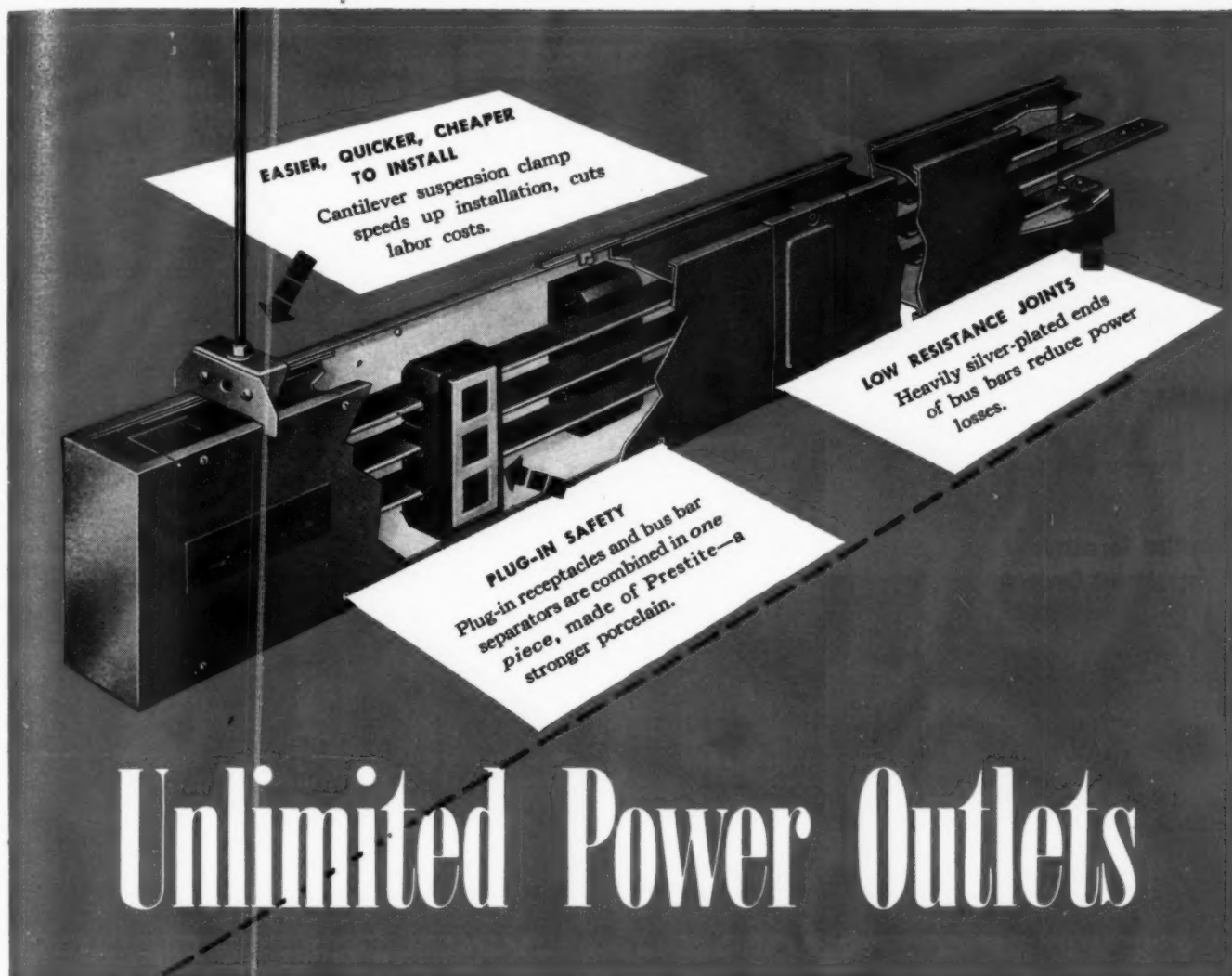
Dallas Inspector Resigns

T. M. Kersey, vice-president of the Texas Chapter IAEI and chief electrical inspector of the city of Dallas, recently resigned his post to become affiliated with the Superior Electric Company, electrical contractors of that city.

Mr. Kersey's city position has been filled by C. P. Ragsdale, a member of the department.



PRIORITIES PROBLEMS and their effect on the electrical contractor occupy the leisure time of R. J. Russell, East Rutherford, N. J. (left) and Benjamin Brown of Trenton while they enjoy the cool breezes and sunshine of Atlantic City.



Westinghouse

BUS DUCT

EVERYTHING FOR COMPLETE SYSTEM INSTALLATION

Plug-in, Feeder, Weatherproof, and Low Impedance Bus Duct, fittings and accessories; and a complete range of devices for the protection of branch runs and load circuit.



at low cost!

Westinghouse Bus Duct meets industry's vital need for readily available power outlets and highly flexible secondary power distribution.

Westinghouse Bus Duct has unlimited power outlets for plugging in the load. Plug-in connections are *safer* and *stronger* because the plug-in opening is a combination receptacle and bus separator made of Prestite, an exclusive Westinghouse feature.

Installations are easier, quicker, and less expensive. The cantilever clamp method of hanging is so simple that only three tools are required: screwdriver, flat wrench and block and tackle.

Heavy, silver-plated contacts, dust-tight construction, slide-along receptacle covers and a dozen other design features add up to Westinghouse superiority.

For sale by over 100 Westinghouse agents in the United States. For complete details on the Westinghouse Bus Duct system, call your Westinghouse representative. And, today, write for Bulletin 3005, Westinghouse Electric & Manufacturing Company, Dept. 7-N, East Pittsburgh, Pa.

J-60491

Questions ON THE Code

Answered by
F. N. M. SQUIRES

Chief Inspector New York Board of Fire Underwriters

Identified Terminals of Attachment Devices

Q. "We use a color code in wiring three prong plugs and receptacles. These wiring devices are used on 110 volt, single phase lighting circuits and 110 volt circuits are supplied from single phase 220 volt transformers with a common grounded neutral, (3 wire system).

"We are interested principally in knowing which terminal on the plug is the identified terminal. The bright brass terminal is used as the identified one and the neutral white coded wire is to be connected to this terminal. However, there is some doubt in our mind as to whether this or the bronze coated terminal to which is connected the black coded wire, is the identified one.

"Specifications were interpreted from Article 200, Paragraph 2008-F and 2009 in the 1940 edition of the N. E. Code. Will you please advise us if this method is correct?"—S. G. S.

A. As the white coded wire is connected to a light brass colored terminal, the black coded wire to a bronze colored terminal and the grounding conductor to a terminal marked "GR," this arrangement meets the requirements of the National Electrical Code.

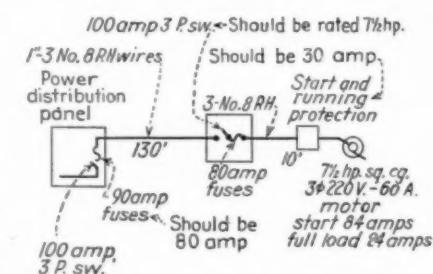
Paragraph 2008-F of the Code requires that three wire receptacle and caps, in which one terminal is used for grounding, shall have this grounding terminal marked in some other manner than that used for marking the terminals for the circuit conductors; that is, in some manner other than that by the color scheme. Underwriters' Laboratories require that the grounding terminals be marked either "G", "GR", "Ground" or "Grounding" which is another manner than by color and this,

therefore, is acceptable under the Code.

When the grounding terminal is marked as required "the other terminals need not be marked for identification" but of course may be marked by the color scheme if the manufacturer so desires, in which case the "substantially white in color" terminal is to be used for connection to the grounded conductor and some other "readily distinguishable different color" used for connection to the black wire.

Motor Connections

Q. "The accompanying sketch shows the connections for 3 ϕ , 220-volt, 7½ hp. squirrel cage motors as called for in the specifications. The contractor thinks that the size of wires must be increased in order that the same will be properly protected by 90



amp. fuses on power distribution panel.

"As I understand the National Electrical Code (1940), the motor branch circuit overcurrent protection shall be capable of carrying the starting current of the motor but not necessarily to be of the size for proper protection of the wires against overload. (The wires are protected against the overload rather by the running overcurrent device)"—B. A. L.

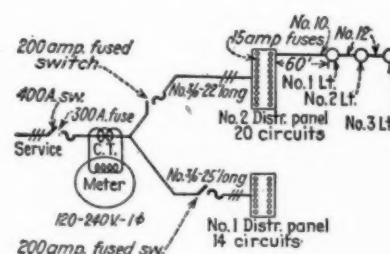
A. The data shown in the accompanying sketch is correct with the following exceptions.

The fuses in the "power distribution panel" should be not larger than 80 amperes; the disconnect switch ahead of the starter should be rated 7½ hp. instead of 100 amps.; and "running protection" at the starter should be not over 30 amperes.

As overloads in a motor branch circuit originate in the motor it is felt that the motor protective device located at the starter will provide overcurrent protection while the line fuse at the panel will provide short-circuit protection" at the starter should be not

A Wiring Layout

Q. No. 1. "What is wrong with the following lighting layout for a store?"—L.P.A.



A. No. 1. The chief thing wrong with the layout as shown in the sketch is that the service and feeder fuses are too large for the wire sizes shown in the diagram.

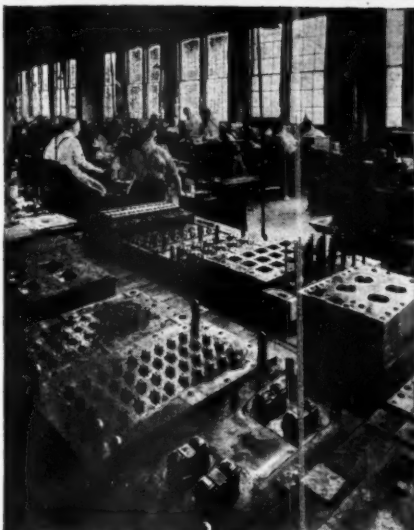
According to Table 1 of carrying capacities of wires, the service fuses should not exceed 275 amperes (nearest standard size to 265 amp.) and the feeder fuses should not exceed 150 amps. (nearest to 138 amps.)

Under the 1937 Code the service fuses could have been of 400 amp. capacity and the feeder fuses could have been 175 amps. We use Table 1 as we assume that this is a conduit job.

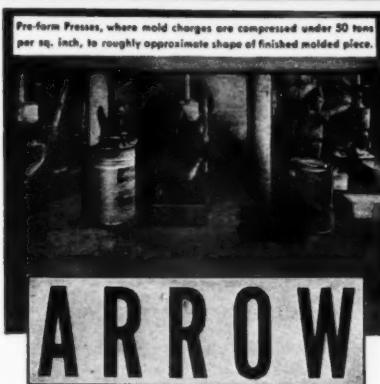
Another error indicated in the sketch is a violation of Section 3807 in that the switches are shown with the blade connected so as to be alive when in the open position. Of course they should be connected so that the blades will be dead when the switch is in the open position.

No. 2. "May one change wire sizes without fusing, providing the fuse is small enough to protect the smallest wire in that circuit such as per sketch—from Panel 2 to lights 1 and 2?"—L. P. A.

A. No. 2. Yes, this is permissible according to Section 2434b of the Code.



Above: General Tool Room, with molds in foreground. The hardened steel molds, ground and polished, are subjected to great pressure in molding.



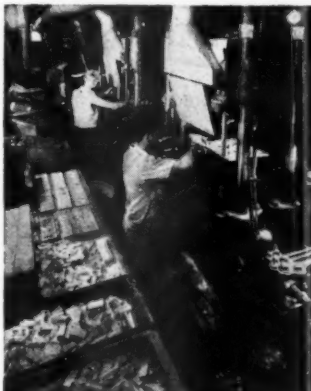
Pre-form Presses, where mold charges are compressed under 50 tons per sq. inch, to roughly approximate shape of finished molded piece.

ARROW

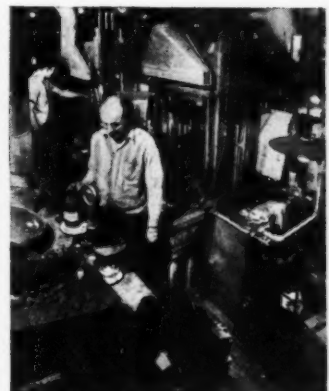


Semi-automatic Hydraulic Presses, for compression molding. Mold is heated by steam and material hydraulically compressed, being "set" into a hard plastic.

BAKELITE PLANT



Hydraulic Presses making wall plates. These machines apply a pressure of 160 tons per sq. inch, and produce 15 plates on one closing of the molds.



Hydraulic Pressing of panel units and large circuit breakers. A single panel unit requires application of 100 tons pressure, using combination of powder and pre-forms.



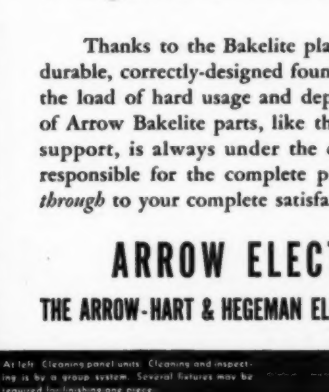
Air-compressed Semi-automatic Molding Presses, utilized for the shorter runs and particularly where extreme accuracy is required in the smaller parts.



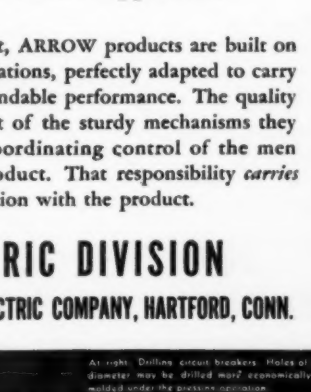
Sanding Operation, where Bakelite pieces from the presses are cleaned of burrs and fins by manipulation on sand belts.



Automatic Cleaning Fixture for finishing wall plates. This machine removes used flash, left in holes during the pressing operation.



At left: Cleaning panel units. Cleaning and inspecting is by a group system. Several fixtures may be required for finishing one piece.



At right: Drilling circuit breakers. Holes of small diameter may be drilled most economically than milled under the pressure condition.

HERE, PLASTICS ARE MADE OF THE REQUISITE QUALITY FOR YOUR ARROW LINES OF WIRING DEVICES AND MOTOR CONTROLS

This plant bears out the ARROW policy of making in our own factories everything that could make Arrow products *better*. From preforming the mold charge to the most complicated automatic compression molding, every operation is carried out by seasoned experts with highly efficient machinery and specialized equipment.

Exceptional facilities are necessary for so diversified a line as Arrow's, where a great variety of shapes and designs must be executed with extreme accuracy. For these Bakelite parts are the very *bases* of Arrow Switches, Wiring Devices and motor control apparatus.

Thanks to the Bakelite plant, ARROW products are built on durable, correctly-designed foundations, perfectly adapted to carry the load of hard usage and dependable performance. The quality of Arrow Bakelite parts, like that of the sturdy mechanisms they support, is always under the coordinating control of the men responsible for the complete product. That responsibility *carries through* to your complete satisfaction with the product.

ARROW ELECTRIC DIVISION

THE ARROW-HART & HEGEMAN ELECTRIC COMPANY, HARTFORD, CONN.

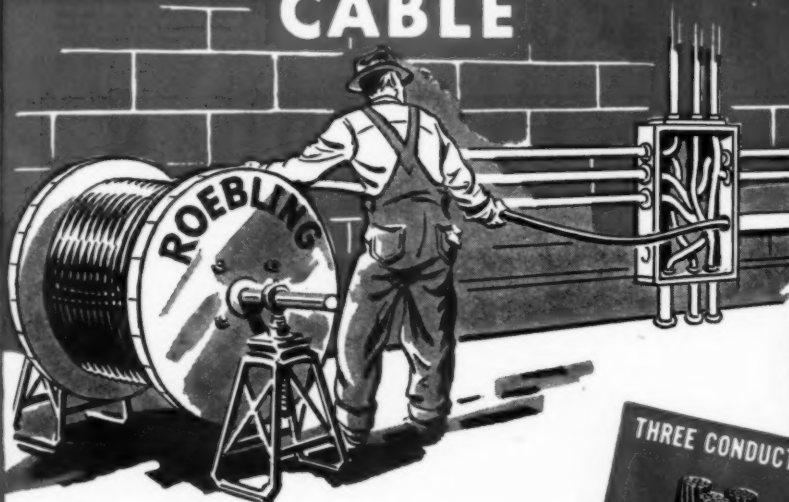
TEMPERATURES ARE HIGH...

SO IT'S

ROEBLING

Varnished Cambric

CABLE



Whenever heat is a factor on your power, heating and lighting circuits specify a Roebling Varnished Cambric Insulated Cable.

Operating temperature can safely go as high as 85°C., for example, on lines up to 5000 volts. And because only the finest grade of black asphalt tape is used—higher dielectric strength and low power factor are obtained.

ABOVE GROUND—If excessive moisture is encountered, cable should be lead encased or enclosed in an extra heavy reinforced rubber sheath. For normal installations a braided covering is satisfactory, the type of finish depending upon service conditions.

UNDER GROUND—Must be lead sheathed. If buried directly in the ground or installed in mine shafts, steel tape armor is usually added over the lead sheath. In a bore hole, vertical riser or submarine cable, round wire armor may be necessary.

Single or multiple construction—furnished in all sizes of conductors from 2,000,000 circular mils to 14 AWG in single conductor or 750,000 circular mils to 14 AWG in multiple conductor. Thickness of insulation and test requirements are in accordance with Insulated Power Cable Engineers Association specifications.

OVER 60 OTHER TYPES

of Roebling Electrical Wires and Cables are made in our mills under complete Roebling supervision and inspection—from copper bar to final reeling or spooling. They include: Power Cables, Weatherproof Wire, Bare Wire and Strand, Building Wire, Portable Cords and many others.



JOHN A. ROEBLING'S SONS COMPANY

TRENTON, NEW JERSEY

Branches in Principal Cities

Questions
in the Code

[FROM PAGE 84]

Q. No. 3. "Are both 220 amp. switches and fuses required in the sub-feeds which are less than 25 ft. long?"—L. P. A.

A. No. 3. If the service switch is "externally operable" (as it is required to be) the switches are not required in the feeders, although the fuses are. According to Section 2434d these feeders must be protected, each by a single set of fuses, located not over 25 feet from where the feeder branches off from the main. The 14 or 20 branch circuit fuses in the distribution panels do not constitute "a single set of fuses" (and if they did 14 by 15 amps. equals 210 amps. and 20 by 15 amps. equals 300 amps., so they would not be acceptable anyway).

OFFICIAL INTERPRETATIONS

by the

Electrical Committee of the N.E.P.A.

Interpretation No. 217

QUESTION . . . Does section 4105, or any other section of the 1940 edition of the National Electrical Code, require that metal boxes for switches or for receptacles be grounded when located over sinks in kitchens (a) if the switch or receptacle plates are of metal, or (b) if the switch and receptacle plates and switch handles are of the insulating materials?

ANSWER . . . Section 4105 applies only to exposed equipment if the boxes are used with a metal-clad wiring system that must be grounded in any event, as specified in paragraph (a) of section 2542. Exposed equipment associated with these boxes, however, must be grounded if within range of plumbing fixtures. If the boxes are not installed in a metal-clad wiring system and are exposed and are within range of plumbing fixtures they should be grounded.

Interpretation No. 218

QUESTION . . . Is there a violation of the National Electrical Code involved when two terminal screws are provided on each side of a receptacle for attachment plugs and when a circuit is continued through an outlet fitting by connecting a conductor going through the box to both screws of the pair; the conductor itself not being continuous between the screws of the pair?

ANSWER . . . No.

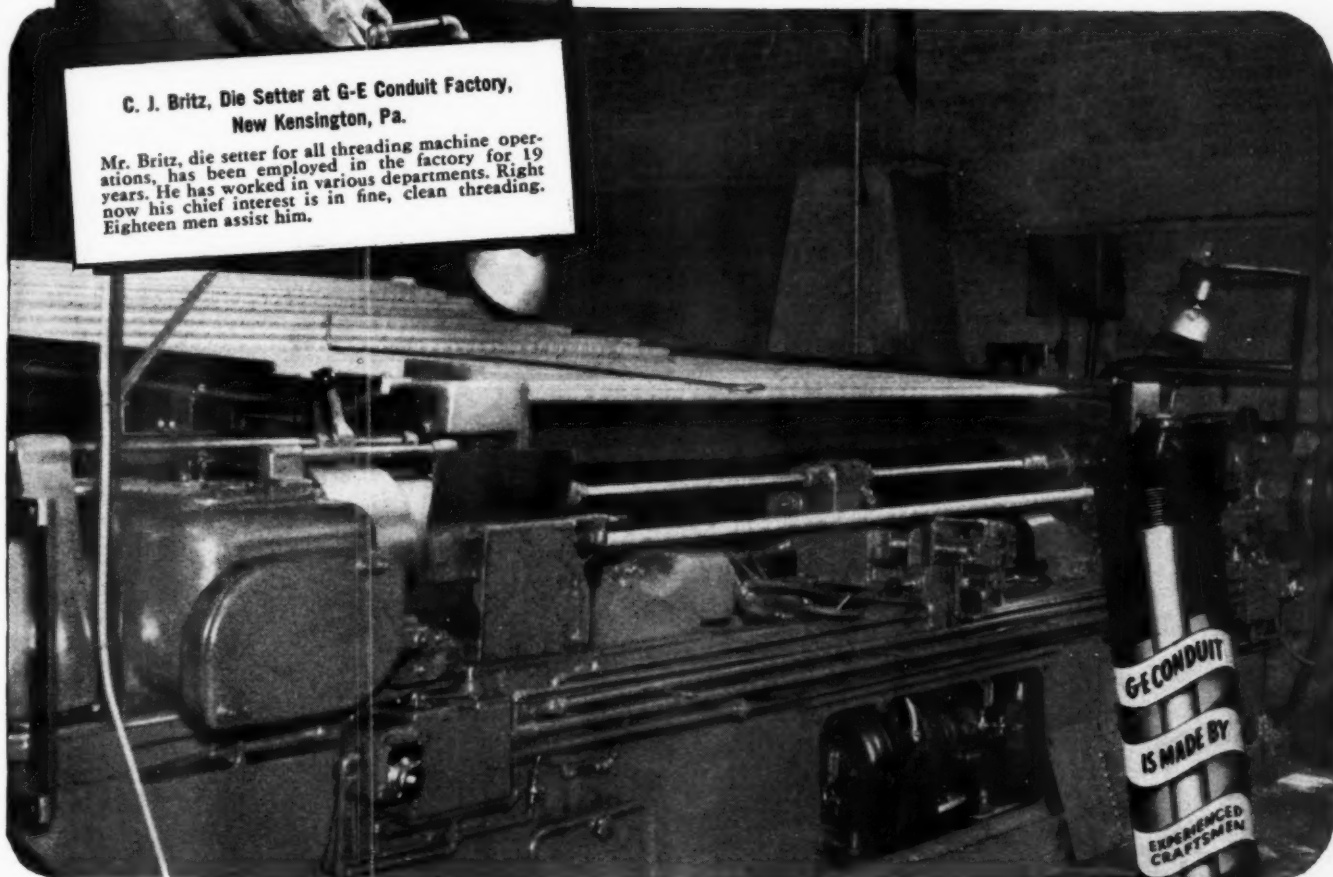


**C. J. Britz, Die Setter at G-E Conduit Factory,
New Kensington, Pa.**

Mr. Britz, die setter for all threading machine operations, has been employed in the factory for 19 years. He has worked in various departments. Right now his chief interest is in fine, clean threading. Eighteen men assist him.

G-E RIGID CONDUIT Is Threaded Automatically

No. 6 of a Series — Men and Processes Behind G-E Conduit



G-E Conduit on Threading Machine

NEW modern machines, the best made for the purpose, cut sharp, tapered threads into the ends of G-E conduit automatically. The high quality of steel tubing used for G-E conduit enables this operation to be performed easily at high speed; and also enables threads to be cut quickly on the job.

Threading is done after pickling and hot-dipped galvanizing or enameling to avoid possible damage to the threads during these processes. As a result, threads on G-E conduit are clean cut and accurate. Frequent careful gauging provides the uniform threads essential for speedy installation. Eighteen skilled craftsmen handle the threading process. Careful checks are made of the threading machine continually. The conduit itself is carefully examined before and after threading.

For further information about G-E conduit, see the nearest G-E Merchandise Distributor or write to Section C-282, Appliance and Merchandise Department, General Electric Company, Bridgeport, Connecticut.

GENERAL ELECTRIC

Mr. Priority Holder...

**YOU
CAN GET
Paragon
TIME CONTROLS
Now!**



*Write
for
This
Book*

IT fully illustrates and describes the numerous models of time switches, timers, and time delay relays which Paragon can supply now to priority holders. Paragon instruments are being used widely in war equipment. The same qualities of up-to-the-minute design, ruggedness, precision, reliability and minimum service requirements which give them preference in civilian applications fit them for the strenuous demands of battle.

Write today for your complimentary copy of the Paragon catalog.

PARAGON ELECTRIC COMPANY
401 South Dearborn Street, Chicago, Illinois

Paragon Chicago

BUILDERS OF CONTROL INSTRUMENTS

SINCE 1905



[FROM PAGE 86]

Interpretation No. 219

QUESTION NO. 1... If the required number of outlets required in section 2110 for a dining room are installed on the branch circuit specified in section 2109, may additional receptacle outlets be installed in the dining room on a 15-ampere branch circuit?

ANSWER NO. 1... No.

QUESTION NO. 2... Where the outlets required in section 2110 are installed in a dining room and a kitchen on the special circuit specified in section 2109, is it permissible to fuse this circuit at 20 amperes in spite of the probability of plugging in portable lamps having medium duty lampholders?

ANSWER NO. 2... Yes.

Interpretation No. 220

STATEMENT... Non-metallic sheathed cable is installed in the rough chase in a masonry wall (cinder or concrete block, brick, or stone). The chase with the cable in place is then covered with asphalt covered roofing paper with an over-lay of expanded metal lath, then plaster is applied.

QUESTION NO. 1... Does the installation of the non-metallic sheathed cable in the chase when covered in the manner described in the statement, violate section 3362?

ANSWER NO. 1... No.

QUESTION NO. 2... Will there be a violation if the chase is located below grade?

ANSWER NO. 2... No, unless in a wet location (see definition).

QUESTION NO. 3... May non-metallic sheathed cable be fished in the hollow spaces of concrete or other kinds of masonry units?

ANSWER NO. 3... Finding of Interpretation No. 185 seems to apply. It reads as follows:

"Question 1: Does section 3362 permit the installation of non-metallic sheath cable in the hollow spaces of cinder block walls when installed at the time the wall is being constructed?"

"Finding: No."

"Question 2: Does section 3362 permit the installation of non-metallic sheath cable in the hollow spaces of cinder block walls if the cable is fished in after construction of the wall?"

"Finding: No."



DON'T FORGET

that for circuit and motor protection you ought to use

THERM-A-TRIPS

(fuses with thermal cutout)

which end needless interruption, but never interfere at any time with safe operation. Their time-lag feature allows motors to start or run on normal overloads, but they protect against excessive overloads and short circuits. No moving parts, no mechanism to set, no other other overload protection is required, and they operate regardless of length of time in service. For individual motors or circuits with motor-driven apparatus they are the most complete, positive, flexible and economical protection you can have. Plug type, 125 volt, shows on examination whether blown by overload or short circuit. Ask your dealer about THERM-A-TRIPS today, or write for our Bulletin 405.



THE CHASE-SHAWMUT COMPANY
NEWBURYPORT, MASSACHUSETTS

FUSE MAKERS SINCE 1893

In the News

20TH YEAR FOR CHICAGO MOTOR GROUP

The electric motor repair and service group in the Chicago area recently celebrated its 20th anniversary, installed new officers and selected a new name.

The Board of Directors of the Central District Chapter, NISA, decided to adopt a name that would more clearly advertise the type of business in which the members were engaged. Henceforth, this group will be known as the Electric Motor and Service Association, Central District Chapter, NISA.

This action in no way divorces the local group from its affiliation with the national association which, due to legal hurdles, was unable to take similar action last year.

The executive roster for 1942 includes incumbents Joseph F. Ferrari, Excel Electric Service Co., as president; Edward P. James, Northwestern Electric Co. as vice-president; and James J. Smat, Queen City Electric Co. as treasurer. Harry Ackerman, Premier Electric Construction Co. is the new secretary. Herbert Binner is the executive secretary.

Charles Kaska, Chicago Electric Co., and Carl A. Sievert, Sievert Electric Co. remain on the Executive Board. Harry Condo, Condo Electric Co., joins them as a new member. Eugene J. Ther, Ther Electric and Machine Co., and Arthur Wagner, Sr., Arthur Wagner Co., are serving unexpired terms on the board.

More than 50 were present, including ten "old timers" who were first organizers of the group then known as the Electric Motor Dealers and Repair Shop Association. Representatives of a number of motor manufacturers joined the group in enjoying a delicious dinner, birthday cake and top notch entertainment.

CONTRACTORS LAUNCH ESTIMATING COURSE

The Cook County Electrical Contractors Association, Chicago, launched a new course in estimating for its members

January 20. The school is an innovation in the Chicago area, according to Herbert Binner, executive secretary of the association, and covers practically every phase of electrical contracting except flatting and new home wiring.

One of the prime reasons for having the school is to teach smaller contractors, who in the past have been doing house and apartment work, the intricacies of estimating and supervising industrial electrical construction work. By doing this, the association hopes to aid the "students" in qualifying for small plant changeover jobs. This will permit larger electrical contractors to concentrate on the big projects and at the same time expedite small plant transition and keep the smaller contractor in the picture during the emergency.

The school is divided into ten sessions,

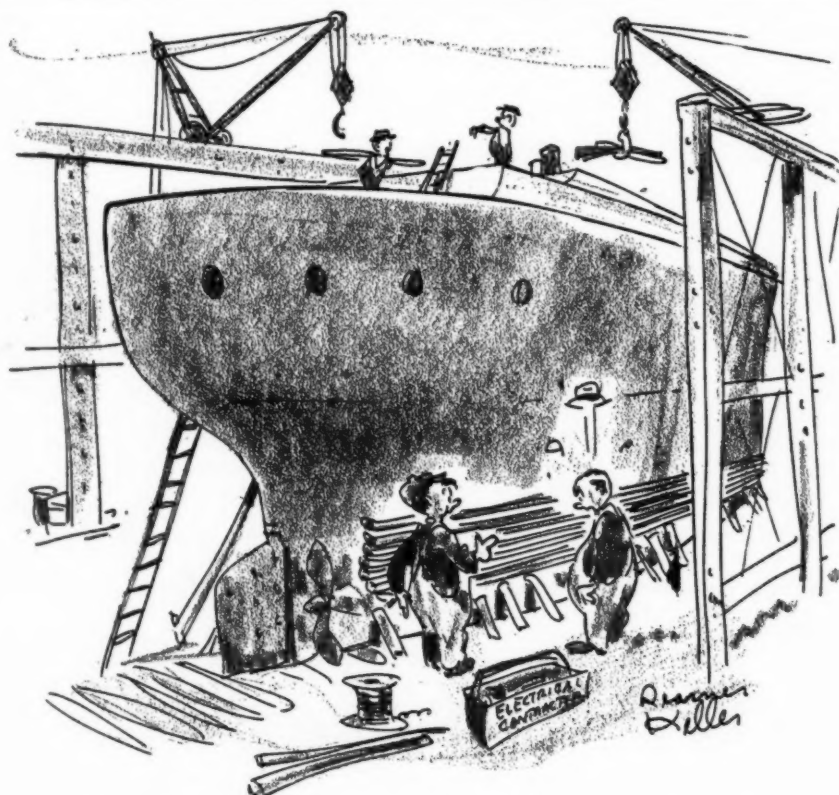
each lasting two hours. Two groups meet each week, one group of approximately 30, assemble every Tuesday night in a North Side trade school; the other group of about 20 gather at a South Side school every Thursday evening.

Ralph M. Decker, who has had more than 30 years estimating and supervising experience for some of the largest electrical construction firms in the West, is the instructor. He has perfected a comprehensive course covering blueprint reading and layout of power and lighting systems, taking off materials, listing and pricing of materials and labor and the recapitulation of all to form a finished estimate.

Each must pay a tuition fee of \$7.50 for the complete course. The fact that it is a good investment is indicated by the enrollment of 50, which was purposely kept low to permit individual instruction and supervision when necessary. The school, according to Mr. Binner is just one more service that an aggressive contractor organization can offer to promote the welfare of its members and to direct contractor talent into war industry channels.

SHEPARD MADE CHIEF ENGINEER

Robert B. Shepard, head of Underwriters Laboratories' electrical work since 1924, has been made chief electrical engineer, through action of the Executive Committee of the Board of Trustees.



"I'm running all the conduit cables on the outside, boss, to prevent any sabotage from within."



Saves Fluorescent Installation and Maintenance Time

Westinghouse has reduced the job of industrial reflector attachment and removal to a simple "twist of the wrist." A mere quarter turn of two tension-locked thumb latches instantly attaches or detaches the take-down reflector. No tools are required. There's neither wasted time nor effort in installation, maintenance or servicing.

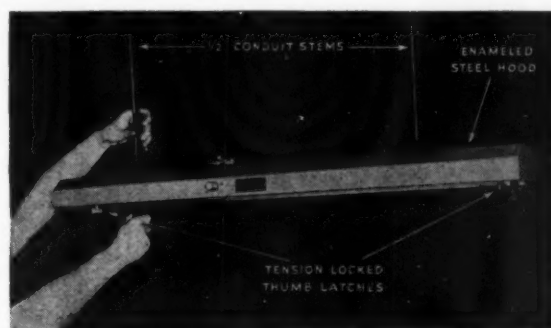
For general or supplementary lighting, Westinghouse provides two types of RLM, porcelain enameled units: Type FP, with closed ends; and Type FPR, with open ends. Both reflector types fit the same auxiliary-equipped hood. Units are furnished completely wired for 40-watt and 100-watt lamps and for new RF-85-watt lamps in open-end reflectors.

These quick-installation luminaires produce high-intensity illumination without annoying glare, harsh shadows or objectionable heat. They typify the contribution made by Westinghouse *engineered seeing* to practical and effective industrial lighting.

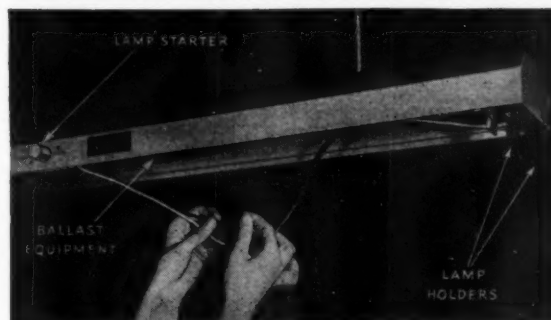
Engineered seeing—based on properly designed equipment and sound application—is available through your nearest Westinghouse Lighting Distributor. Ask him today for Fluorescent Catalog F61-000. Or, write Westinghouse Electric & Mfg. Co., Edgewater Park, Cleveland, Ohio.

★ ★ ★

Engineered seeing is available through 117 Westinghouse Electric Supply Company offices and Independent Lighting Distributors.



FP and FPR luminaires are easily and quickly installed. Units are arranged for rigid or flexible conduit, or for chain mounting.



Fluorescent ballasts, starters and lamp holders are mounted in the hood. Line connections are quickly spliced to fixture leads.



Porcelain enameled, take-down reflector is attached to the hood by a quarter turn of two tension locked thumb latches.

Westinghouse

LIGHTING
EQUIPMENT



SPEED UP WIRING JOBS The IDEAL Way



IDEAL BX Armor Cutter

Speedy—Cuts armor from 2 or 3 wire No. 12 or No. 14 BX in one operation.
Economical—No wasted BX.
Handy—Pocket size; easy to use.
Inexpensive and blade is easily removed for sharpening.

IDEAL Wire and Cable Reel

Trouble-Saver — Prevents those exasperating snarls and knots. Prevents damage to wire.

Adaptable—Handles insulated wire, No. 18 to No. 2 cord, cable, Romex, etc.
Convenient — Hangs anywhere, singly or in tandem.



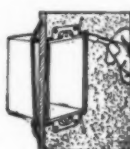
IDEAL Fish Tape, Reel and Puller



Tape-Saver — Eliminates expensive tape-breakage.
Sure-Grip—Reel easy to hold firmly—Tape can't slip when pulling.
Complete with 50 ft. 3/4" x .045" tape.
3-Tools-in-one — No. "00" size—Only \$1.50.

IDEAL "Snap-Tite" Switch Box Supports

Adaptable—hold any standard sectional switch box securely in composition walls.
Easily applied — no screws or special tools needed.



IDEAL Joist Boring Machine



Versatile: bores at any angle, through joists, rafters, etc. **Makes boring easier**: no climbing, no stooping, no stretching.
Easily assembled—works below or up to 11 ft. above floor level.

IDEAL "WIRE-NUTS"



Solderless, Tapeless, Wire Connectors

So easy—Just strip wires, screw on, that's all! **Craftsmanlike job**—no messy joints.
Safe—No heat; no open-flame hazard; pass inspection quickly.
Better electrically; stronger mechanically.
Fully Approved: listed by Underwriters' Laboratories, Inc.
Prompt Shipment.

Other IDEAL Time-Savers



IDEAL SOLD THROUGH JOBBERS

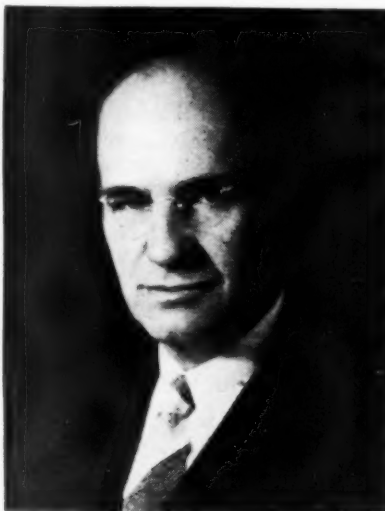
Ideal Commutator Dresser Co.
1041 Park Avenue Sycamore, Illinois
Sales Offices in Principal Cities

In the News

[FROM PAGE 90]

The new title was created to make clear that Mr. Shepard's responsibility extends over all Electrical Department work, including that done at the New York, Chicago and San Francisco testing stations.

Mr. Shepard joined the Laboratories' staff in 1913 as a factory inspector in



ROBERT B. SHEPARD

Schenectady, N. Y. In 1917 he was made assistant electrical engineer in charge of the electrical work in the eastern part of the country. In 1922 he was promoted to the position of associate electrical engineer, and in 1924 was appointed electrical engineer.

COMING MEETINGS

National Electrical Manufacturers Association—Midwinter meeting, Palmer House, Chicago, Ill. Feb. 16-20.

Minnesota Electrical Council—Annual Convention, Minneapolis, Minn. Feb. 22-24.

CONTRACTORS PLEDGE VOLUNTARY AID

The Electrical Contractors Association of the District of Columbia displayed its patriotism recently when it pledged its members to voluntary aid in case of emergency.

Realizing that a major emergency might disrupt electrical service and overtax utility facilities, the group wanted to help in the event of such a condition. The Association placed itself squarely behind local civilian authorities by adopting the following resolution: "Resolved: That the members of the Electrical Contractors Association . . . pledge to Commissioner Young their voluntary aid, as and when asked for immediate electrical emergency."

KNOW ELECTRICITY AS EXPERTS KNOW IT



—AND GET AN EXPERT'S PAY

What about your future? Who is safe today? Surely not the man who is contented to stand still! Know your job thoroughly—prepare yourself for jobs ahead. To do just this thousands of men have used

The CROFT Library of Practical Electricity

7 Volumes, 2906 pages

1948 how-to-do-it illustrations

● The Croft Library is a complete electrical educator. It is founded on practice—on 20 years of shirt-sleeve experience—on work as it is actually done. It is jammed from cover to cover with the kind of hardheaded facts you want. Written so that the beginner can easily understand it, yet so sound, so thorough, that it is the daily guide of 59,000 highly paid electrical workers and engineers.

● Croft tells you the things you need to know about motors, generators, armatures, commutators, transformers, circuits, switchboards, distribution systems—electrical machinery of every type—illumination in its every phase—the most improved methods of lighting—lamps and lamp effects, etc.—how to do a complete job, from estimating it, to completion.

NO MONEY DOWN

EASY PAYMENTS

10 DAYS' FREE EXAMINATION

Fill in and mail the coupon below and we will send you the entire set of seven volumes for ten days examination on approval. We will take all the risk—you assume no obligation. If you decide to keep the books, send \$3.00 in ten days and the balance at the rate of \$3.00 a month.

SEND THE COUPON NOW

AND SEE THE BOOKS FOR YOURSELF

EXAMINATION COUPON

McGraw-Hill Book Co.
330 W. 42nd St., New York

You may send me the seven volumes of the Croft Library of Practical Electricity for 10 days' examination. I agree to return the books, postpaid, in ten days or remit \$3.00 then and \$3.00 a month until the special price of \$18.00 has been paid.

(To insure prompt shipment, write plainly and fill in all lines.)

Name

Home Address

City and State

Position

Name of Company E.C. 2-42



Why your Red Cross urgently needs

FIFTY MILLION DOLLARS, NOW

How the fund is allocated . . .

What it does in service

Every dollar that you give now to your Red Cross marches into the thick of things where humanitarian help is needed most—up to the fronts and battle stations where the fighting is heaviest. Into the Red Cross hospitals and First Aid units where prompt medical attention and supplies may save innumerable lives. And throughout our broad land to train and equip volunteers to meet any emergency that may strike.

How the \$50,000,000 War Fund is Used

SERVICE TO THE ARMED FORCES \$25,000,000

Provides for the care, welfare and morale of the Army and Navy, including services to men in hospitals and during convalescence. • Provides an important link between the service men and their families; keeps the families from breaking up, supplies food, shelter, medicine, and even jobs where necessary. • Provides essential medical and other supplies outside of standard Government equipment. • Operates Red Cross headquarters at camps and naval stations. • Enrolls blood donors and medical technologists for Army and Navy needs. • Provides millions of surgical dressings, sweaters, socks, etc. through volunteer workers.

DISASTER AND CIVILIAN EMERGENCY RELIEF • \$10,000,000

Supplies emergency needs for food, clothing, shelter and medical attention for disaster victims. • Assists stricken families in repair of homes and other adjustments; provides minimum reserves of essential relief supplies to prevent unnecessary delays.

CIVILIAN DEFENSE SERVICES \$ 5,000,000

Trains volunteers for home nursing and nurses' aides. • Trains nurses, men and women, for active duty with the Army and Navy. • Trains volunteers in First Aid and accident prevention. • Trains volunteers for work in Motor Corps, Canteen and Production. • Instructs men, women and children in preparedness against explosive and incendiary bombs. • Organizes for evacuation of children and their families from stricken areas. • Assists Red Cross Chapters in establishing effective coordination of emergency relief with local and State defense authorities.

SERVICE AND ASSISTANCE THROUGH CHAPTERS • \$ 4,000,000

Gives assistance and service to the 3,740 Red Cross Chapters with their 6,131 Branches responsible for local Red Cross activities, particularly welfare work among the service men and their families.

OTHER ACTIVITIES AND CONTINGENCIES . . . \$ 6,000,000

Provides for unforeseen expansions in program and for new activities made necessary by unexpected developments.

TOTAL \$50,000,000

THE AMERICAN RED CROSS \$50,000,000 WAR FUND

Note to Red Cross Canvassers: Use the material on this page to better inform contributors how their donations are being expended.

This space contributed to The American Red Cross by ELECTRICAL CONTRACTING

P&S

WIRING DEVICES

for NATIONAL DEFENSE



NEW . . . Pull and Keyless Porcelain Cleat Receptacles. Designed for the Defense Market.

Send for your copy of our new "Defense Catalog"—a brief summary of the P&S Wiring Device Line which provides a handy reference for selecting materials for construction, repair and maintenance under the Defense Program.

**Sold Through
Electrical Wholesalers**

Pass & Seymour, Inc.
SYRACUSE, N. Y.

In the News

[FROM PAGE 92]

WHITTEMORE ON STATE BOARD

B. L. Whittemore, electrical contractor of Framingham, Massachusetts and past president of the Massachusetts State Association of Master Electricians was recently appointed by Governor Saltonstall to serve as Master Member of the Massachusetts State Board of Examiners of Electricians. The Journeyman member named at the same time was J. Donnelly of Worcester, Mass.

MID-WEST GROUP SHORTENS NAME

The North Central Electrical Industries is the new name of that active mid-western electrical organization, formerly known as the North Central Associated Electrical Industries.

The Board of Directors voted to drop the word "associated" from the title at a recent meeting. It was also unanimously decided to carry on 1942 operations with special activities planned to serve the industry and public in the Victory Program.

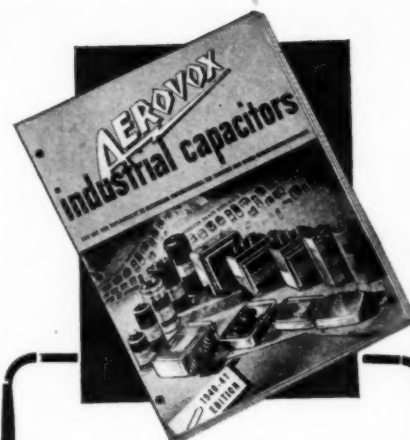
Priorities

REPAIR SUPPLIES AVAILABLE

The priorities Division has provided priority assistance to assure that essential types of electrical supplies will be available through the usual wholesale and retail channels.

Manufacturers of essential types of supplies will be given priority assistance in obtaining the necessary materials, within the framework of the Production Requirements Plan. They will not, however, be required to prove deliveries under rated orders, where the supplies are to be sold to ultimate users not customarily assigned preference ratings.

A manufacturer wishing to qualify for the preference rating available under the program should make application on form PD25a, addressed to the production requirements branch, OPM. If approved, he will be granted priority assistance in securing materials in amounts which will be determined after consideration of the importance of the particular product, amounts previously manufactured, the recommendations of the appropriate industry branches of OPM, and other similar factors.



Get a Copy!

● It's FREE—this combined manual and catalog on motor capacitors. Just the practical data you need in servicing capacitor-start refrigerators—diagrams, charts, formulae, PLUS handy listings of all standard capacitor-start motors and their capacitor requirements. Handy cross-index of Aerovox capacitors and motor manufacturers' part numbers.

Ask your Aerovox jobber for copy. Order your capacitors from him. Or write us direct.



Is It Useful?

Decide for yourself—check the following features of the Electrical Buyers Reference.

- ☐ Condensed catalogs of 260 manufacturers. Not a jumbled pile of loose pamphlets, but one solid, page-after-page section.
- ☐ 146 big pages of product-classified listings of 3500 manufacturers; the "who makes it" section.
- ☐ Alphabetical list of products classified above; completely cross-indexed.
- ☐ Company names, trade names, street addresses . . . over 6000 listings.
- ☐ Everything up-to-date, and edited for 1942 use!

Or a total of 537 pages packed full of buying and specifying information, all in one handy, ever-ready volume: **ELECTRICAL BUYERS REFERENCE**.

Active electrical men say it's the most valuable volume in their offices. Use it yourself . . . it's your first source of information.

• ELECTRICAL • BUYERS REFERENCE

330 West 42nd Street, N. Y. City

Also a part of the program is Suppliers Order M-67, addressed to retailers, wholesalers, jobbers, and all other distributors of these supplies. To assure an equitable distribution of these items, essential to public health and welfare, it establishes maximum inventory levels and prevents the accumulation of excess stocks at any stage of the distribution process.

The new program does not affect the provisions of Preference Rating Orders P-100, P-46, P-56, P-68, and other repair and maintenance orders issued on behalf of industry.

CARS FOR A-1-j CONTRACTORS

The ban on sales of new cars and light trucks was modified last month to allow three classes of purchasers to obtain delivery. In addition to military and certain government bodies, the order permits prime contractors holding an A-1-j rating or higher, to buy new cars.

The amendment, effective immediately states:

"Any person who meets certain conditions and is a prime contractor with the United States Army or Navy for the construction of a defense project being built by the Army or Navy, and to whom the Army or Navy assigned an A-1-j or higher rating. The conditions are that the prime contractor must obtain a signed statement from the Army or Navy officer in charge of construction of the project stating that acquisition of the vehicle is necessary for the construction, and must deliver the statement to the seller of the vehicle."

RULES FOR PRIORITY COPIES

Reproduction of Priorities Division forms and orders is permitted only in accordance with the following instructions, according to a statement by the Division of Priorities:

Any application form, including form PD-1, may be reproduced.

Any report form, including inventory report forms, may be reproduced.

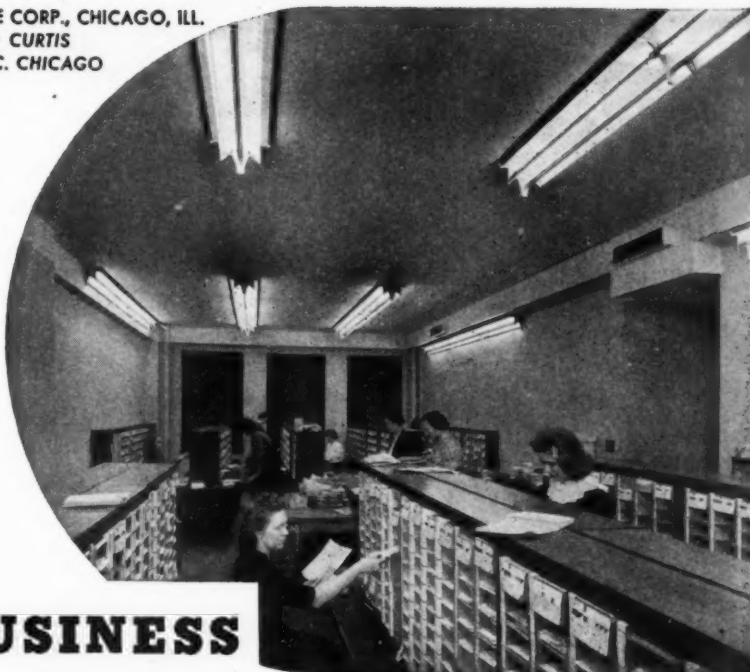
Any "M" order, "L" order, or "E" order may be reproduced.

As to "P" orders, two rules are to be followed:

1. If the order is issued to a general class of persons, and does not name any individual as the recipient of the order (as is the case in P-22, the Maintenance and Repair Order) the order may be freely reproduced in the same manner as "M" orders.

2. If the "P" order has been issued for the use of specifically named firms or individuals, it may be reproduced for use either by the individual producer or by his suppliers who are entitled to use the order, by the photo-offset or similar photographic process. Such copies must be identical in size and every other respect




F. W. DODGE CORP., CHICAGO, ILL.
Installation by CURTIS
LIGHTING INC. CHICAGO



BUSINESS re-lights!

For Working Comfort and Increased Efficiency

Yes—America relights—in homes and business. And in defense industries where maximum efficiency is required, sight saving fluorescent lighting is rapidly becoming a symbol of *right light* . . . the right light to minimize the danger of eyestrain . . . to help speed national defense orders by reducing errors caused by faulty lighting.

But an installation is only as good as its ballasts. That's why you should look for these seals:  to be sure that the ballast has been tested and approved for safety;  to know that it has been laboratory tested for heat tolerances, Watt input control, hum, and wave shape tolerances;  for assurance of dependability and quality. Write for bulletin FBB-0430, giving full details of the entire Chicago Transformer line.

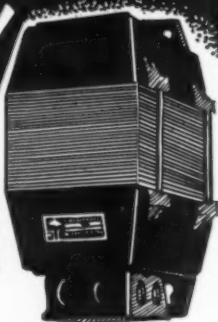


**CHICAGO TRANSFORMER
CORPORATION**

3505 WEST ADDISON STREET • CHICAGO

HOW ACME AIR COOLED TRANSFORMERS can SAVE you MONEY

Every electrical contractor, electrical supply house and service shop should study this important message. It solves the problem to many "quick service" jobs.



SAVES DOUBLE WIRING DOUBLE METERING

An Acme Air-Cooled Transformer connected to the 440 or 220 volt power circuit provides for 110 volt secondary taps for standard lighting and accessory circuits. This saves two separate wiring circuits (one for power, one for light), which allows for metering on power line only with potential savings accumulating month by month.

SAVES REWIRING

Rapid expansion in many plants, through the installation of additional machinery and electric motors may overtax the carrying capacity of circuits originally intended for lighter loads. For example, a plant increasing its 220 volt electric motor load 25%, 50% or 100% need not rewire throughout but simply change its supply to 440 volt thus doubling the capacity of old wiring, and by installing Acme Air-Cooled transformers at department circuits or sections, 220 volt may be tapped off.

EASY TO INSTALL—SAFE

Acme Air-Cooled transformers require no separate fireproof booths or cages. No oil needed. May be located at the machine or plant department where current changing is required. Easily installed.

DO YOU HAVE A BREAKDOWN TESTER?



Every trouble-shooter should have this portable, handy testing unit. Plugs into 110 volt primary circuit, and provides for insulation breakdown voltage in adjustable steps from 500 to 2500 volts. Equipped with safety light and heavy duty testing prongs. Write for Bulletin.

THE ACME ELECTRIC & MFG. CO.

36 WATER ST.

CUBA, N. Y.

Acme Electric
TRANSFORMERS

In the News

[FROM PAGE 95]

with the order as issued by OPM. Blank forms of "P" orders may be reproduced for informational purposes only when they are stamped "Specimen" or "Sample" so as to make it clear that the copy is for information only and not for use.

The purpose of these rules is to permit reproduction of forms and orders for (1) informational purposes, or (2) for purposes of applying for priority assistance, or (3) furnishing information to the OPM—but also to prevent reproduction of forms and orders which might lend themselves to improper use.

Whenever any form required by the OPM is reproduced, for whatever purpose, it must be reproduced in the exact format, language, color, type, size and phraseology of the original.

The general instructions permitting qualified persons to reproduce "P" orders, by photo-offset or similar photographic process, do not, however, take precedence over any specific instructions or regulations which have been issued in connection with any specific order.

ALLOCATIONS FOR EMERGENCY HOUSING

Fast, large-scale expansion of defense housing was promised January 7 by Defense Housing Coordinator Palmer, in announcing that President Roosevelt had allocated \$153,000,000 to the Federal Works Agency for approximately 42,000 demountable houses to be built in some 50 defense areas throughout the country. In addition, \$13,000,000 was allocated to the Farm Security Administration for 5,667 trailers and 5,200 dormitory units, to be located in 22 localities.

Representing more than half the sum recently made available by Congress for emergency housing, the allocation dwarfs all previous orders for demountable housing, and is the biggest step yet taken in speeding up the defense housing program, Mr. Palmer stated.

Designed for rapid erection and ready removal to other locations when necessary, demountable housing is considered by experts the best answer to acute housing shortages in defense communities where the population is expected to decline in the post-war period, and where ghost towns might result from too much permanent construction to meet emergency needs. While demountable houses need not necessarily be prefabricated, it is expected that a large proportion of the projected 42,000 homes will be built by the latest streamlined construction methods.

Although all past speed records must be broken if defense housing is to keep pace with industrial expansion under the victory program there will be no relaxing of standards, Palmer asserted.

The complete list of defense localities

AIR-RAID SIREN CONTROLS

Timing devices for the operation of sirens or signals to sound "Alert", "Air-Raid" or "All-Clear" signals. Designed to meet any specification or schedule of coded signals desired.

BLACK-OUT EMERGENCY LIGHTING SYSTEMS

Provide automatic lighting of DC or blackout bulbs from a source of 6, 12, or 32 volts DC on intentional or accidental interruption of normal AC power lines.

Write for Information

AUTOMATIC
Electric Manufacturing Co.
MANKATO • MINNESOTA

Insulation Tests Simplified!

No more
tiresome cranking
of a
hand driven
generator



**NEW
STANDCO**

B-5 MEGOHMER

Ranges: 0-200 Megohms
0-2000 Ohms
0-300 & 0-600 Volts DC

Steady test voltage of 500 volts DC instantly available, at the touch of a push button. Direct readings of insulation resistance obtained on special color-graded scale without any calculations.

PLEASE MAIL BULLETIN 430

Name.....

Firm.....

Address.....

HERMAN H. STICHT CO., INC.
27 Park Place • New York, N. Y.

included in the January 7 allocations is not yet available. Funds released by this action will, however, apply to the following communities, where Presidential approval of defense housing has already been announced but where funds have hitherto been unavailable for construction:

Alton-E. Alton, Ill., 200 units; Campo, Calif., 30; Dayton, Ohio, 750; Elkton, Md., 350; Jackson-Milan-Humboldt, Tenn., 200; Keyport, Wash., 125; Quantico, Va., 250; Sacramento, Calif., 125; Sebring, Fla., 193; Shreveport-Minden, La., 200; Springfield, Ohio, 250.

Previously programmed as permanent housing, now changed to demountable: Buffalo (Cheektowaga), N. Y., 1,050; Buffalo (Lackawanna), N. Y., 400; Mobile, Ala. (Brookley Field), 1,060; Morgantown, W. Va., 150; Muscle Shoals, Ala., 100; Orange-Beaumont-Port Arthur, Tex., 300; Philadelphia (Bristol), Pa., 200; Seattle, Wash., 100.

LEAD USE

CUT

Under Conservation Order M-38-C, the use of lead for certain civilian uses will be prohibited.

No restrictions, however, are placed on the use of lead in military contracts nor in a specified list of essential products including solder, condenser foil and "where it is called for by underwriters or safety regulations."

Approximately two-thirds of the available monthly supply, including scrap, now is demanded for ratings of A-10 or higher.

BULK AND FILLING STATION

JOB CURTAILED

Under Conservation Order M-68-C, the Division of Priorities has forbidden the construction of new facilities or improvement of existing facilities for marketing petroleum products. Exception may be permitted on special authority and work already begun can be finished.

High priority rating, however, has been assigned to projects in the petroleum industry which contribute to the war effort. Order P-98 assigns a rating of A-1-a for the repair of equipment when there has been an actual breakdown of operations.

—WITH THE—
Manufacturers

General Electric Changes

H. H. Barnes, Jr., commercial vice president of General Electric Co., retired on January 1 after completing 40 years of service with the company. Mr. Barnes had been in charge of the company's

Where Others Fail
TRY DELTABESTON



Charity Begins At Home

NO SIR—we are not like the farmer who sells all the cream and keeps only the skimmed milk for himself and his family. We in the General Electric Company are very particular about the materials which go into our products. That's why, after exhaustive tests, our engineers selected Deltabeston Asbestos- and Glass-insulated Wires and Cables for so many applications. We use them, just to give a few examples, in Switchboards, Rheostats, Fluorescent Ballasts, Reactance Coils, Street Railways, Bus and MD Motors, Ranges, Hot Water Heaters, and Table Appliances, and in many locations in our plants where other wires and cables would fail.

Deltabeston Wires and Cables are distributed nationally by Graybar Electric Company and all G-E Merchandise Distributors. If you want to know more about these cables, write to Section Y-2112, Appliance and Merchandise Dept., General Electric Company, Bridgeport, Connecticut.

GENERAL  ELECTRIC

ONE WAY TO "KEEP 'EM FLYING"



is to **KEEP ON
SUPPLYING**



**BALANCED
QUALIFICATIONS**



All that the
Name Implies

**DEFENSE-DEPENDABLE
BRUSHES**

for

**ELECTRIC TOOL
MOTORS**

**HAMMERS • DRILLS
TAPPERS • VALVE REPLACERS
Etc.**

• • • • •

Always Ready



**SUPERIOR
CARBON PRODUCTS, INC.**

9110 George Ave. Cleveland, Ohio

In the News

[FROM PAGE 97]

activities in the New York district since May, 1928.

After 40 years of service with G. E., J. C. Dallam, manager of the wiring device section of the appliance and merchandise department has retired.

Mr. Dallam is succeeded by T. D.



Foster who, in addition to his new duties as manager of the wiring device section, will retain his present position as manager of the accessory equipment section. Mr. Foster joined the G-E wiring device section in 1924.

Elliott Harrington, for the past year sales manager of the air conditioning and commercial refrigeration department at Bloomfield, N. J. has been named manager of sales for the Schenectady induction motor section of the G-E motor division.



William C. White has been appointed director of an electronics laboratory in which will be centralized G-E's advance development activities in the field of electronics. The new laboratory has been established as a division of the Radio and Television department.

Three appointments in the New England District has been announced. R. W. Adams became assistant district manager; R. W. Herrick, manager of the Central Station department and D. E. Walch, manager of the Providence Office.

STOP

GUESSING!

INSTALL WARE HI-LAG FUSES

Time-Lag, 2 to 5 Times Normal
Current . . . Meets Federal
Specification WF 803 Type II.
Approved by Underwriters

1. **ENDING**, False-Alarm Fuse Blowing—Needless shutdowns—Costly Production losses with Precious Material Wastage.
2. **HANDLING**, heavy starting overloads—operating Current surges.
3. **HOLDING**, Low Contact Resistance with fuse overheating worries Eliminated.

Write for Bulletin FK7

KEEP MOTORS HUMMING



WARE BROTHERS
4410 W. LAKE ST., CHICAGO

Allis-Chalmers Elects New Officers

At a recent meeting of the Board of Directors of Allis-Chalmers Mfg. Co. in Milwaukee, Max W. Babb, president of the company, was elected chairman of the board of directors. W. C. Buchanan a director and member of the Executive Committee was elected to succeed Mr. Babb as company president.



Mr. Babb in becoming chairman of the board, will fill the position formerly occupied by the late General Otto H. Falk, which has been vacant since his death in 1940.

Mr. Buchanan has for the past six years devoted a substantial portion of his time to the Globe Steel Tubes Co., in Milwaukee, of which he is president and in which capacity he will continue.

New Posts to ILG Representatives

Several promotions were made in the sales organization of the Ilg Electric Ventilating Co. of Chicago.

Byron L. Casey of the Chicago City Sales Office has been named district manager of the Northern territory, supervising branch offices in Chicago, Milwaukee, Minneapolis, Galesburg and South Bend.

Wallace G. Burbo has been appointed as manager of the Boston branch office.

Charles E. Parks, formerly manager of the Pittsburgh branch office, has been transferred to Los Angeles, where he will assume new duties as district manager of the Pacific Coast territory.

Charles H. Schneider, formerly in the Philadelphia Branch office, assumes the post vacated by Mr. Parks, as manager of the Pittsburgh Branch office.

In Houston, Texas, W. M. Vernor has been placed in charge of the Ilg branch office under the jurisdiction of Joseph J. Friedler, manager of the southern territory.

Trico Fuse Mfg. Co. Milwaukee, Wis., announces the appointment of the following personnel as representatives: Pacific Industrial Products Co., Oakland, Calif. covering the northern part of California; H. H. Van Luven, Los Angeles, covering the southern part of California, all of Arizona and Nevada; Albert S. Knight Co., Seattle, covering Washington, Oregon, northern part of Idaho and the western part of Montana; and M. F. Holland Co., Baltimore, covering the entire state of Maryland.

Westinghouse Electric and Manufacturing Co. announces the appointment of George H. Woodard as manager of the new products division. Mr. Woodard will continue as executive assistant in the company's emergency products division.

Walker Electrical Company, Atlanta, Ga., announces the appointment of L. P. Spoon as sales engineer. Mr. Spoon was formerly with the Crouse-Hinds Company and Harrison-Wright.

Westinghouse Electric Supply Company has announced the appointment of two new district merchandise managers. Curt L. Blumer of the Pittsburgh sales force becomes merchandise manager of the East Central District, with headquarters in Pittsburgh. E. C. Ricker was named Southwestern District merchandise manager with headquarters in Dallas, Texas.

You can do it *quicker* with a

QIKLUG

QIKLUG
Type QA

Compactness is an outstanding Qiklug feature. The Qiklug is quickly and rapidly installed even in limited working space.

Qiklug variations are available for multiple cable accommodation, unusual angles, long cable drops and other requirements.

Write for Catalog No. 41, listing other Burndy Connectors

BURNDY 107 EASTERN BLVD.
NEW YORK, N. Y.

When CABLE INSULATION Gets Wet

no harm is done if ANHYDREX deproteinized rubber insulation has been used. ANHYDREX has all the inherent value of rubber insulation — in fact it is rubber insulation, but it will not absorb water and needs no protection from it.

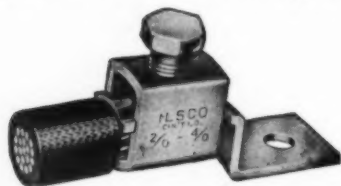
Heretofore when cable insulations got wet every cable engineer knew that trouble was brewing — and it usually came. Water and insulation had to be kept apart or there was no service. Lead sheaths were for years considered a necessary part of submarine or underground rubber insulated cables. They were heavy and expensive but were the only effective available barrier against water.

Doesn't that give you an idea for saving money when you buy cables? We think it must. We will be glad to give you any data you may need to help you save money and get the best of service from ANHYDREX insulated power, control or signal cables.

SIMPLEX WIRE & CABLE CO.
79 Sidney Street, Cambridge, Mass.

ILSCO
SOLDERLESS CONNECTORS

HAVE YOU TRIED
The New IlSCO Lugs?



BUILT FOR OVERLOADS!

The new design—as passed by the Underwriters' Laboratories May 1, 1940.

GENTLEMEN

Send me New Catalog and Sample

Name

Firm

Address

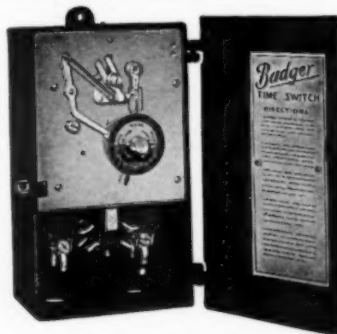
City & State

MAIL COUPON TODAY

ILSCO COPPER TUBE AND PRODUCTS, INC.
5629 MADISON ROAD — CINCINNATI, O.

BADGER

Synchronous
ELECTRIC TIME SWITCHES



CONTRACTORS LIKE THEM BECAUSE:
they are dependable and easy to install

USERS LIKE THEM BECAUSE:
of economical operation and low cost

The Badger line of Time Switches is always in demand by Contractors who want dependability, accuracy, and the right type for a specific need. They know from experience that this is the line that gives them successful, profitable installations. They know when they install Badger Synchronous Electric Time Switches for their customers they are giving them complete satisfaction—accurate timing, economical operation, dependable service. You can't go wrong on Badger. Write for more particulars or see your Wholesaler.

RELANCE AUTOMATIC LIGHTING COMPANY
1937 MEAD STREET RACINE, WISCONSIN

More Gossip

Contractor Qualifications

The following standards that electrical contractors must meet to become "qualified electrical contractors," were outlined by Marion W. Scarborough, field representative of the Virginia Electrical Contractors Association, Inc.

To qualify, a contractor must:

1. Maintain a recognized place of business and have a business phone.
2. Have a good bookkeeping system.
3. Be financially sound, have a good credit rating and discount all bills.
4. Have the necessary technical knowledge to do this type of work.
5. Produce quality workmanship and use quality materials.
6. Have adequate tools and testing equipment.

Contractors fulfilling these requirements will be presented with a certificate indicating they are qualified to do electrical construction work. This is just one more step to assuring the public of safe and adequate electrical installations. According to Mr. Scarborough, several of the smaller contractors are already meeting these standards and consequently improving their business.

Lighting for Breakfast

The Electrical League of Milwaukee furnished the guest program at a recent meeting of the Sunday Morning Breakfast Club at the Wisconsin hotel. A skit featuring home lighting and some of its problems was presented by Orville Nichols, league president; Mrs. Orville Nichols; Al Englehard, Wisconsin Electric Power Co.; and L. T. Hammond, Moe Bros. Lighting Fixtures Co. A demonstration of fluorescent lighting was presented by I. L. Illing, Wisconsin Electric Power Co.



GEOGRAPHIC EXTREMITIES mean nothing to G. W. Austen, Toronto; and G. J. Segel, New Orleans as they discuss present and post-war promotional activities at the recent I.A.E.L. conference in Washington, D. C.

Antigo Electrical Ordinance

Antigo, Wisconsin, has climbed aboard the band-wagon of safer electrical installations. A new ordinance providing for the licensing of master electricians went into effect Oct. 30.

The new measure sets up a board of examiners consisting of the chief of the fire department, the electrical inspector and one master electrician named by the city council. The initial fee is \$20 with an annual renewal fee of \$5. The Board of Examiners also has the power to revoke the license of any violator of any of the city electrical ordinances.



JERSEYITES in Washington during the recent IAEL convention included (standing L to R) Jack Masters, Ronald King, Dick Osgood, Dudley Allen, Dick Rutter; (seated L to R) John Cook, Thomas Hunter and Howard Suckling. They were the delegates of the New Jersey Council of Electrical Leagues at the meeting.

Blackout Instructions

Blackout instructions and suggestions are being sent to industrial plant executives throughout the Buffalo area by the Electric Association of the Niagara Frontier. The association plans to continue to forward this information for the duration of the war.

The instructions embody the following major points:

1. Do not open the main supply switch or circuit breaker. This may result in the stoppage of elevators, ventilating fans, fire pumps, stokers and oil burner motors and other essential equipment.
2. Determine which interior lights may be left burning without being seen from outside. Turn out others individually or by means of branch circuit switches or remote control.
3. Install blue lamps in essential corridors, stairways and other places which may not readily be screened.
4. Clearly mark switch and circuit breaker handles which are to be opened or left closed.
5. Keep on as many lights as possible. Be sure they throw no direct or reflected light to the outside.
6. If in doubt about any electrical problem, get in touch with your electrical contractor or other electrical consultant.



FORESIGHT demands FLOODLIGHT!

WITH America at war, there can be no excuse for negligence these days... no excuse for trying to make hindsight answer for foresight. Every plant producing goods for war or even civilian needs is vitally important to the national welfare. Respon-

sibility for guarding against sabotage is the problem of each plant individually.

Floodlighting of grounds is the first step in industrial protection. Do it now! Do it properly! See your nearest Goodrich distributor or write us.



We invite those responsible for providing safeguards against sabotage in industrial plants to write for this timely and helpful circular. Ask for folder No. 101.

GOODRICH

INDUSTRIAL LIGHTING



The Goodrich line includes a wide variety of incandescent and fluorescent fixtures for every industrial requirement. Literature on request.

SOLD ONLY THROUGH ELECTRICAL WHOLESALERS

GOODRICH

ELECTRIC COMPANY

OFFICES IN ALL PRINCIPAL CITIES

GENERAL OFFICES AND FACTORY: 4602 BELLE PLAINE AVENUE, CHICAGO, ILL.

EQUIPMENT *News*

Fixture Studs

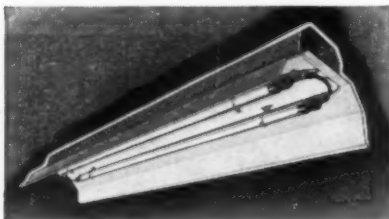
New fixture studs, developed for G-E bar hangers so that boxes may be attached with a single operation, have been announced. These studs are now used on all G-E bar hangers, both standard and S-shaped, which formerly were supplied with two-operation studs. Wiring room in boxes is saved through use of this stud. Two small self-locating lips take place of locknut formerly used. Boxes may be tightened with a screwdriver and also may be reset on bar with same tool. By locating nail holes of the bar as far back of the edge of the joist as the edge of the box, the latter will then protrude $\frac{1}{2}$ inches, which is far enough for the average plaster, lath, or wallboard finish. General Electric Company, Bridgeport, Conn.



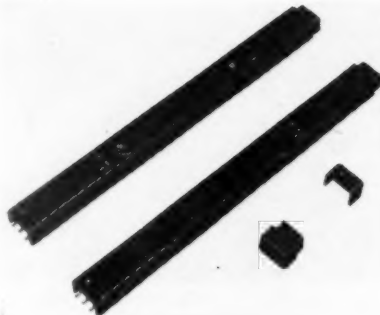
G-E FIXTURE STUDS

Fluorescent Lighting

This new "RF" fluorescent lighting equipment is available for industrial use. It is claimed to provide four advances in operating efficiency and economy—more light for power consumed; new solution to flicker problem; quicker, surer starting and installation and maintenance costs are lowered. It can be used in locations where high mountings or wide spacings of fixtures are required. Units are available in either single or twin lamp types. Both are open end models of porcelain enamel. The units require 85 watt "RF" lamps and are 65 $\frac{1}{2}$ inches long. Benjamin Electric Mfg. Co., Des Plaines, Illinois.



BENJAMIN "RF" LIGHTING EQUIPMENT



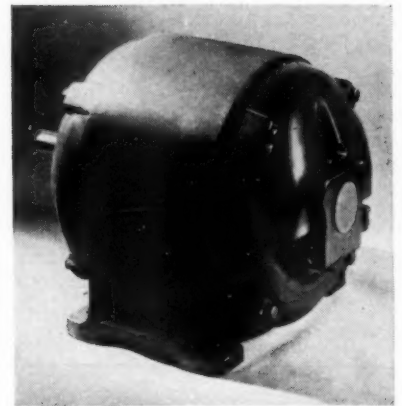
PIERCEWAY SYSTEM

Wiring System

New sectional plastic surface wiring systems, known as Pierceway, have been announced, for use in factories, stores, offices and homes. It provides an outlet for every 8 inches of circuit run, making available as many outlets as may be required for increased lighting or production. The systems are designed for use as 2 or 3 wire 115/230 volt d.c. or single phase a.c. final circuits. Systems comprise four basic parts—feed section, outlet section, male and female caps. Series No. 200, medium duty size, is rated at 35 amperes for continuous operation. Series No. 300, heavy duty size, is rated at 45 amperes for continuous operation. These series are not interchangeable. Some of the features claimed are ample copper, adequate outlets, flexibility, safety, insulation, mechanical protection and non-metallic enclosures. It is designed for mounting on surface of walls and ceilings. Pierce Laboratory, Inc., Summit, N. J.

Telephone Cable

A new mine telephone cable with the mechanical and electrical strength of large cables but a diameter of slightly over $\frac{1}{4}$ inch has been developed. This twisted-pair, No. 14 Awg solid cable is designed for mine telephone service where induced currents and cross talk must be reduced to minimum. Versatol insulation makes cable heat and moisture resistant. A tellurium-compounded rubber jacket insures protection against mine waters and soil acids. Breakage is reduced by use of tinned-copper conductors, with one conductor ribbed for identification. General Electric Co., Schenectady, N. Y.



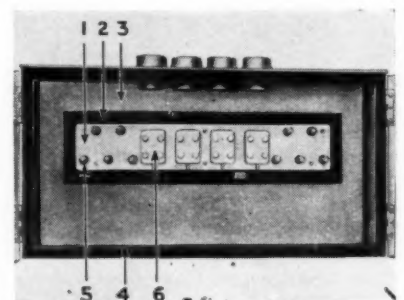
ALLIS-CHALMERS MOTOR

Motor

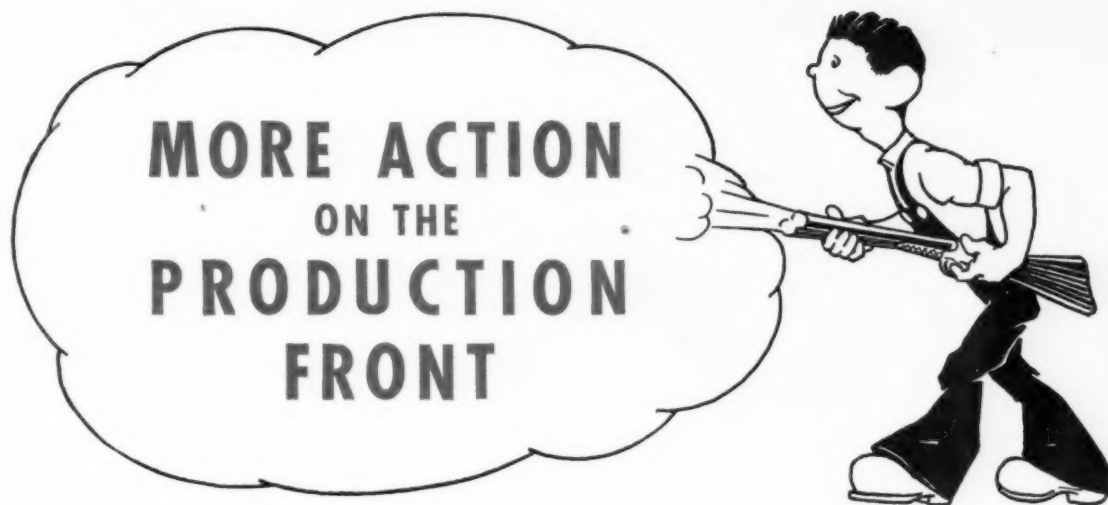
The "Safety-Circle" protection is a new feature of this Lo-Maintenance motor. Specially developed to give the motor all-around protection, the "Safety-Circle" is a wide, solid rib integrally cast as part of the frame, which forms an unbroken circle of protection around the stator. One-piece cast frame and cast end-shields guard the motor from exterior knocks and abuse. Some of the other features are improved bearing design; rotor keyed to shaft for strength; oil drains at bottom of bearings for easy flushing; removable end-brackets and large conduit box for handy wiring. Allis-Chalmers Manufacturing Co., Milwaukee, Wis.

Welding Terminal Panel

A welding terminal panel has been developed for use in shipyards and similar installations in connection with the constant potential system of welding feeders. It provides opportunities to install at any desired points, panels that intercept main welding feeders throughout the yard and provide facilities for welding leads. Panels are solid bronze casting mounted on asbestos block, which is mounted in No. 10 gauge iron box. Box top is slanted to shed water. Slots in bottom of box provide entry for welding leads which are to be attached to terminal studs on panel. Removable plates or clamps provide means for tapping main feeder. O. Z. Electrical Mfg. Co., 262 Bond Street, Brooklyn, N. Y.



O. Z. WELDING TERMINAL PANEL



IF YOU are a User of electrical products, and are in this war up to the hilt, enlist more aid from your powerful ally, the Electrical Wholesaler.

He too is a fighting man on the Production Front. Tell him what you want. He will go into action, and deliver if humanly possible.

MORE. Give this Electrical Wholesaler of yours a freer hand to help you. Consider him more than ever before as your Up-to-the-Minute Man for quick and intelligent service.

MORE. He knows, and will tell you, who makes what. Which manufacturers can deliver now. Where alternate materials can be unearthed and put to use without delay.

MORE. He warehouses stocks for you. Helps you meet your production schedules. Brings you latest catalog, price and shipping information.

MORE. Your Wholesaler can send you skillful engineering counsel whenever you have tough technical problems to iron out. He can tell you how new O.P.M. Preference Rating Orders affect your day's work.

MORE. As the Electrical Wholesaler is your ally, so he is ours. All T & B products are earmarked for war. We distribute them with proven efficiency and economy to every section of our country's vast Production Front. We do this entirely through the T & B Electrical Wholesaler, and his competent service organizations.



THE THOMAS & BETTS CO.

INCORPORATED

MANUFACTURERS OF ELECTRICAL FITTINGS SINCE 1899

Factory, Engineering and Executive Offices, Elizabeth, N. J.

FOR DEFENSE OF VITAL WAR PRODUCTION *AGAINST LIGHTNING*



INVESTIGATE WEST DODD

★ Aside from the other hazards, lightning is one of the two leading sources of fire according to records of the National Board of Fire Underwriters'. Fire in any plant now turning out vital war materials would be costly to Uncle Sam.

West Dodd lightning and static control equipment provides thoroughly reliable protection. It is being widely used on U. S. Government ammunition magazines, igloos and shell loading plants.

Many items of West Dodd materials have been especially designed to meet U. S. Government specifications and requirements. Approved by Underwriters' Laboratories. Passed by American Institute of Electrical Engineers. Backed by the pioneer and largest manufacturer of such equipment.

A FEW WEST DODD INSTALLATIONS

Savanna Ordnance Depot, Savanna, Ill.	Plum Brook Ordnance Works, Sandusky, O.
Elwood Ordnance Plant, Elwood, Ill.	Hoosier Ordnance Plant, Charleston, Ind.
Ravenna Ordnance Plant, Ravenna, O.	Seneca Ordnance Depot, Kendaia, N. Y.
Kingsbury Ordnance Plant, Kingsbury, Ind.	Aberdeen Proving Ground, Baltimore, Md.
Umatilla Ordnance Plant, Hermiston, Ore.	Edgewood Arsenal, Baltimore, Md.
Lone Star Ordnance Plant, Texarkana, Tex.	Iowa Ordnance Plant, Burlington, Ia.
Louisiana Ordnance, Shreveport, La.	Illinois Ordnance Plant, Marion, Ill.

WEST DODD LIGHTNING CONDUCTOR CORP.

A RELIABLE PROTECTION AGAINST
A LEADING CAUSE OF FIRE



420 LEXINGTON AVE., NEW YORK CITY
GOSHEN, INDIANA

FREE The West Dodd Engineering Department will be glad to assist in planning the application, or estimating costs.

EQUIPMENT *News*

[FROM PAGE 102]

Floodlight

This floodlight is for outdoor service on defense projects of all types. It is recommended for use on buildings, land surrounding buildings, docks, railroad yards, switch tracks, shipyards, waterways and public utilities. The reflector is made of heavy gauge spun steel which has a copper and nickel base plating, then chrome plated. Exterior finish of floodlights is aluminum Ultramel. It is furnished with clear convex heat resisting lens. The bracket for mounting unit, may be used for wall, cross arm or pipe mounting and can be mounted on any size pipe up to 2½ inches. It is available in three sizes—12-in. reflector uses 300-500 watt lamps; 14½-in. uses 750-1000 watt lamps and 15½-in. uses 750-1500 watt lamps. Steber Manufacturing Co., 1020 West Adams Street, Chicago, Ill.



STEBER FLOODLIGHT

Tools

Four new models of the heavy duty Holgun, ½-inch drill, have been developed. These are especially engineered to the heavy production requirements of airplane, aircraft accessories and similar fabricating and assembly operations. End handle and side handle are available in standard speed models and low speed models. All units have 2-pole instant-release switches, with the pistol grip and trigger switch control, suited to either right or left hand operation. Black & Decker, Towson, Md.



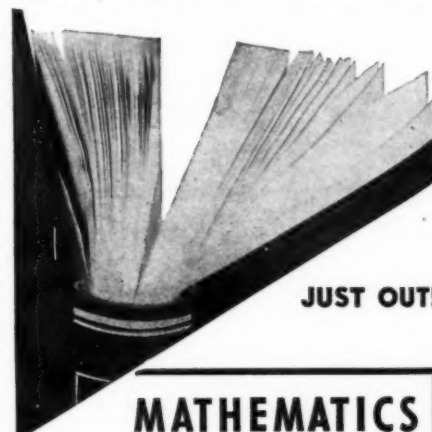
BLACK & DECKER DRILL

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for the solving of everyday
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Radiomen and electricians know that the language and the habit of mathematics are essential to them for real grasp of, and progress in their chosen field. They know that mathematics is a tool for them that they are helpless without.

Now out of the U. S. Navy Radio Materiel School at Anacostia Station comes a complete home-study textbook that is so thorough, so careful in its explanations, so detailed in its examples that any reader "who can perform arithmetical computations rapidly and accurately is capable of mastering the principles laid down in this text."



JUST OUT!

MATHEMATICS FOR ELECTRICIANS AND RADIOMEN

BY NELSON M. COOKE
Chief Radio Electrician, U. S. Navy
Member, Institute of Radio Engineers
604 pages, 6 x 9, \$4.00

This book teaches you mathematics from elementary algebra through quadratic equations, logarithms, trigonometry, plane vectors and elementary vector algebra with direct applications to electrical and radio problems. It teaches you how to apply this mathematical knowledge in the solutions of radio and circuit problems. In other words, it gives you the grasp of mathematics you need and then shows you how to use your knowledge.

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Fluorescent Lampholders

Two new lampholders have been developed in this fluorescent line. No. 4328 is for flat surface mounting. It has two leads, one 9 inches long and the other 27 inches. These lengths provide connections in most fixtures without additional splicing. The No. 4329 is a similar lampholder equipped with a $\frac{1}{8}$ -inch nipple for pipe thread mounting. This has two wire leads 18 inches long. The Bryant Electric Company, Bridgeport, Conn.



BRYANT FLUORESCENT LAMPHOLDER

Mercury Lamp

This new "AH-9" mercury lamp is for the lighting of steel mills, foundries and shops where high mounting heights of luminaires are required. This 3000 watt mercury lamp is rated at 120,000 lumens and it is claimed that the long tubular light source is eight times more powerful than its nearest rival. It is 55 inches long and one inch in diameter. Trial installations have proved that these mercury tubes, in good reflectors and on conventional spacing centers, can provide more than 50 foot-candles of light evenly distributed over the working plane. The new 3000-watt mercury lamp resembles G-E's 100-watt mazda fluorescent lamp. Each is known as an electric discharge type of lamp. It requires a special transformer for proper operation. General Electric Co., Nela Park, Cleveland, Ohio.



G-E MERCURY LAMP

G-E BUILDING WIRES AND G-E CORDS

LONG LIVED DEPENDABLE UNIFORM

You will obtain excellent lasting service from G-E building wires and cables and from G-E cords because they are carefully made of the finest raw materials. Quality is high. Accurate centering of conductors is provided by continuous vulcanization of insulation.

All grades of G-E wire are easy stripping and easy pulling. G-E cords are flexible and durable.

For further information see the nearest G-E Merchandise Distributor or write to Section W-282, Appliance and Merchandise Dept., General Electric Co., Bridgeport, Conn.



G-E BUILDING WIRES
TYPES

R RP RH RW



Flamenol* Thin-diameter wire for re-wiring existing raceways.

*Reg. U.S. Pat. Off.

A few of the many G-E all-rubber cords. Cord X, Cord X Jr., Type PO-SJ "Rip Cord." G-E line also includes many braided cords.

GENERAL ELECTRIC

The MOST COMPLETE LINE OF *Terminal Lugs*

THOUSANDS
of patterns—
you can find
the exact lug
you want.

Penn-Union
E-Z Lugs take
a wide range
of conductor
sizes. Only 5 sizes of lugs for wire and
cable from No. 6 to 1,000,000 CM. Self-
locking; positive. Re-used over and over.



QUICK,
SIMPLE IN-
STALLA-
TION with
the popular
Penn-Union
VI-TITE lug.

Vise-like action gives a sure grip. Made
in a wide range of sizes.

Fully approved *Soldering Lugs*,
pressed from pure seamless cop-
per tubing, and annealed. Also
cast Heavy-Duty Soldering
Terminals—and shrink fit
lugs for copper tubing.

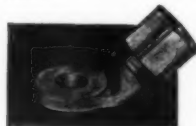
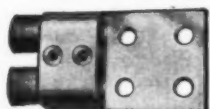


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terminals in wid-
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Straight or angle,
for cable or tub-
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desired contact
tongue.



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universally popular, es-
pecially in the small
sizes. For both solid
and stranded wires.

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CABLE termin-
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lug for two or
more conduc-
tors.



SLEEVE TYPE
terminals, with
split contact
sleeves, preferred
by many large
users. Made in
many types.

See the *Penn-Union Catalog*
for any kind of Terminal Lug
—carefully made, thoroughly
tested, *Dependable*.

Also the most complete line
of Cable Taps, Service Con-
nectors, Ground Clamps, Two-Ways,
Tees, etc.

Sold by Leading Jobbers

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ELECTRIC CORPORATION
ERIE, PA.

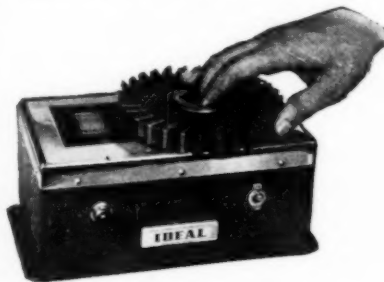
**PENN-
UNION**
Conductor Fittings

EQUIPMENT *News*

[FROM PAGE 105]

Demagnetizer

A new portable demagnetizer for tools, drills, punches, dies, and work held in magnetic chucks. Abrasive particles such as metallic dust, flakes, fine chips, etc. are removed after a single pass across the magnetic poles. It has an indicating light which shows when current is on. It comes in an all metal case. Rating is 115-volt, 50-60 cycle (5 amp.). Other voltages and frequencies available. Size is 5½ by 10½ by 4½-inches. Ideal Commutator Dresser Co., 1041 Park Avenue, Sycamore, Ill.



IDEAL DEMAGNETIZER

Watt-hour Meter Protector

A new meter protector has been de-
veloped to reduce lightning damage to
watt-hour meters, electric ranges and other
appliances connected to 120/240 volt ex-
posed secondary circuits. It is a two-pole
porous block lightning arrestor with a
175 volt line-to-ground rating and a 240
volt line-to-line rating. Gap breakdown on
60 cycle circuits is 800 volts r.m.s. and
gap breakdown on impulse is 2000 volts
crest. Discharge capacity is 10,000 light-
ning surges amperes. Porcelain and cover-
plate mount with two screws in any stand-
ard conduit. Assembly is then covered
with gasket-sealed cover for outdoor service
and non-gasket cover for indoor service.
Westinghouse Electric & Manufacturing
Co., East Pittsburgh, Pa.



WESTINGHOUSE PROTECTOR

IN THE YEARS AHEAD



QUALITY ★ ★ ★
will still be our
PRINCIPAL PRODUCT

Since 1892 Signal Products have estab-
lished themselves as the ultimate in
Quality and Price. In the years to come
Quality will still be the principal prod-
uct of the Signal plant—each year aim-
ing to make the best product for the
price.

SIGNAL ELECTRIC MFG. CO.
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Offices in All Principal Cities

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*Your Best
Choice for—*

RENEWABLE FUSES

"MON-O-LAG"

• • •
**RUGGED
CONSTRUCTION**

**EASIER TO RENEW
MAXIMUM PROTECTION**

• • •
Completely approved



"THE MONARCH LINE SINCE 1909"
Monarch
FUSE COMPANY, Inc.
JAMESTOWN, NEW YORK

Pipe Bender

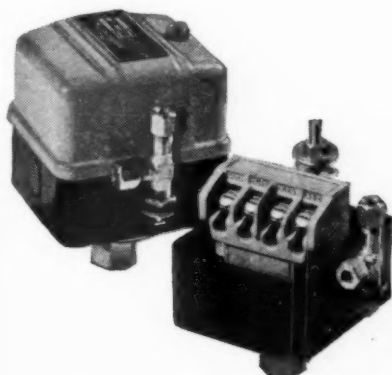
This portable hydraulic pipe bending machine is known as "Tal's Prestal". It bends without heat and filling, conduit, iron, steel, gas, steam and water pipe and also bars from $\frac{3}{8}$ - to 2-in. It is for hand or motor driven. It is claimed that bends can be made up to approximately 180°, depending on size of the pipe. It consists of bender, seven bending formers, flatter for correction bends, extension piston and pipe holder. E. T. Tal, P. O. Box 1942, Milwaukee, Wis.



TAL'S PORTABLE BENDER

Pressure Switch

These pressure switches are two pole devices, especially designed for use with intermediate size air compressor motors. The terminal block is made of porcelain. Pressure limit is 200 pounds, with 15 to 40 pounds differential. Terminal screws are marked and in an upright position for quick wiring. Contacts are generous in size. Range and differential can be changed in the field to meet varying conditions. Available in Types A and A3. The A3 has a pressure release valve. When the pressure switch opens, stopping the motor, the release valve also opens exhausting the air trapped between head and check valve. The motor is then free to start against no load. Square D Company, 6060 Rivard St., Detroit, Mich.



SQUARE D PRESSURE SWITCH


CONTROLS ON "MESS DUTY"



Many of the potato peeling machines used by both Army and Navy are equipped with Ward Leonard Motor Starters. Our long experience in designing and building electric controls, through the intensive electrification period of industry, admirably fits us for the present emergency. We know how to meet special control requirements and how to produce in quantity to government standards.

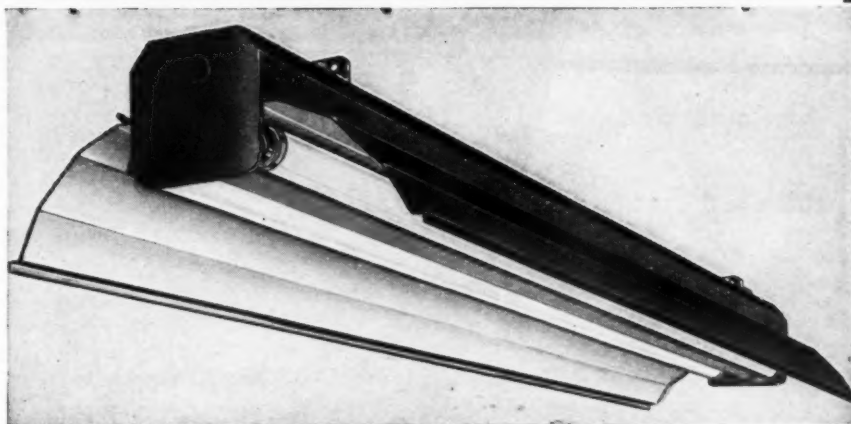
WARD LEONARD

RELAYS • RESISTORS • RHEOSTATS

Electric control  devices since 1892.

WARD LEONARD ELECTRIC COMPANY, 28 SOUTH ST., MOUNT VERNON, N. Y.

INDUSTRIAL FLUORESCENT



FOR INDIVIDUAL OR CONTINUOUS INSTALLATION

Speed up production with these efficient and high quality units. "V" shaped reflector for maximum light output. Open end allows complete utilization of light. Lighting Products' "One Man Installation" feature enables exposing wiring channels at any time without taking the fixture down. Reflecting surfaces finished in "Klasium White", exclusive Lighting Products' enamel that will not crack, chip or discolor, and that gives more light per watt.

Available in one or two lights for 40 and 100 watt Mazda F Lamps.

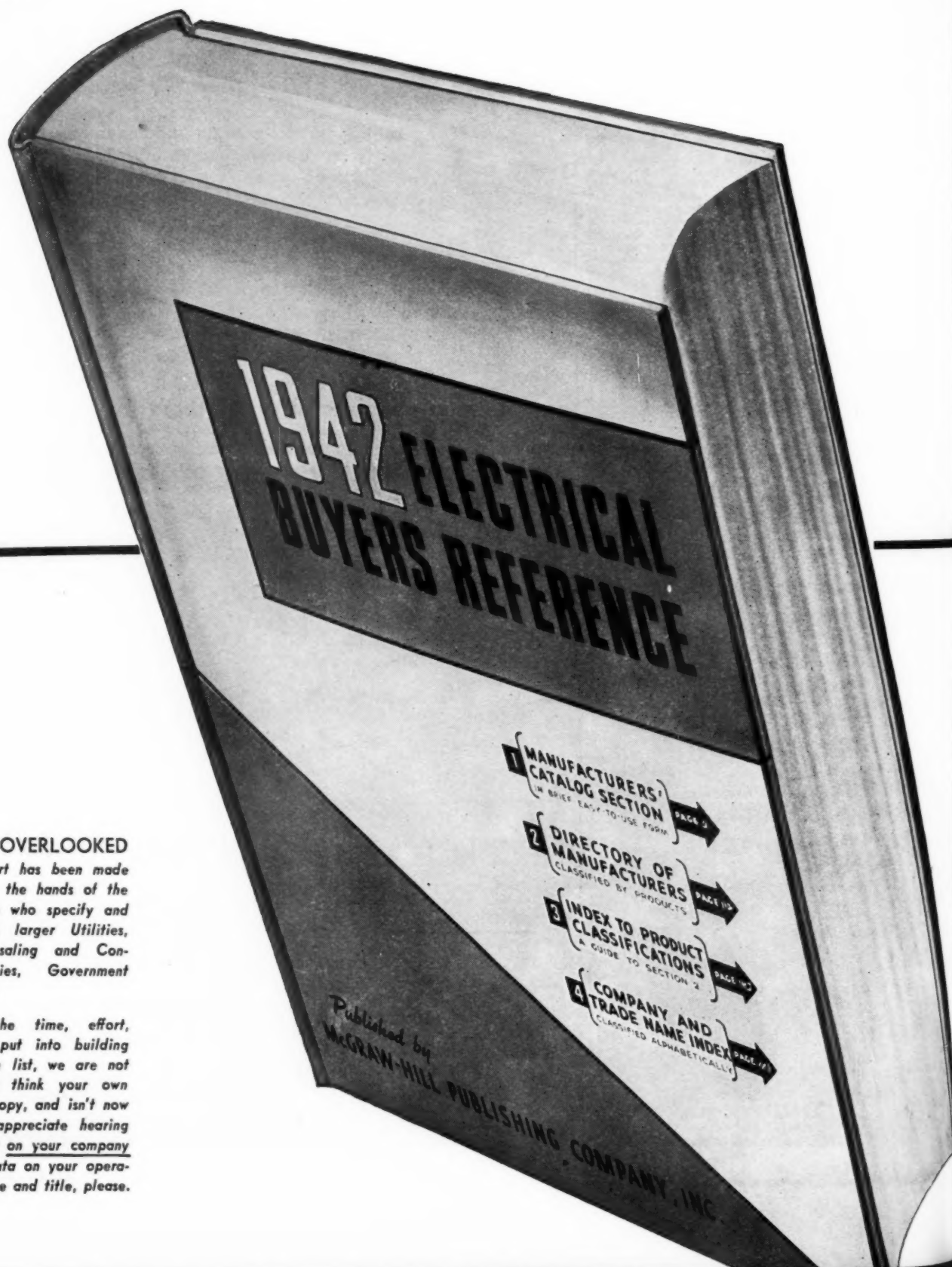
Without obligation, write today for Bulletin 270 and "Klasium" folder with sample of this specially compounded enamel.

LIGHTING PRODUCTS, INC.
HIGHLAND PARK, ILLINOIS U. S. A.

New!

HOT OFF
THE PRESS!

538 pages of the



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Looking for new sources of supply? Here are over
3,500 of them!

Need substitute materials? You'll find plenty of
them listed, and lots of catalog data giving helpful
details.

Want catalog information? In the new Electrical
Buyers Reference you'll find condensed catalogs
(Briefalogs) from outstanding manufacturers, cover-
ing a wide variety of electrical and allied products.
Turn to this 1942 edition *first*—it's the quickest,
easiest way to get the answer to a lot of buying
problems. It will pay to keep your copy within
reach during 1942!

Here's what you'll find in the new '42 Electrical Buyers Reference:

1. **Manufacturers' catalogs**—A series of catalogs, usually in condensed form ("Briefalogs," we call them). These vary in size—depending upon the needs of each manufacturer.
2. **Directory of Manufacturers**—With company names, addresses, and trade names, arranged by product. Extensive cross-references permit quick finding of the electrical and allied products made by over 3,500 manufacturers. Bold-face listings throughout indicate the pages upon which the product data (Briefalogs) of manufacturers is given.
3. **Index to Directory Classification**—A complete alphabetical list of all classifications covered in the Classified Directory Section, cross-indexed from every commonly used name, including adjective references. Facilitates finding of products, regardless of how reference is made.
4. **Index of Trade and Company Names**—Complete with addresses. A buyer starting out with only a trade name quickly gets the buying data he needs.

IN EMERGENCIES, TOO, YOU CAN PUT YOUR TRUST IN **KLEINS**



WHEN winter winds howl and there's ice on the lines! America relies on the man with the safety belt and climbers to keep power surging through lines—to keep messages humming over singing wires.

How important to his safety his equipment is, only he knows. His reliance on Kleins is an adequate testimonial to his realization that when life is at stake, only the best is good enough.

Your copy of the Klein Pocket Tool Guide will be sent on request.

ASK YOUR SUPPLIER

Foreign Distributor:

International Standard Electric Corp., New York



EQUIPMENT *News*

[FROM PAGE 107]

Blackout Bulb

This new blackout bulb is designed for blackout lighting in air raids. It provides downlighting in a soft beam of blue light that is safe for indoor visibility during blackouts. The bulb has a silver reflector lining that hides all filament glare and projects light downward. A black silicate coating covers the bulb up to extreme lighting end, which is deep blue. It consumes 25 watts. Wabash Appliance Corp., 335 Carroll St., Brooklyn, N. Y.



WABASH BLACKOUT BULB

Polishing Lathe

This new magnetic polishing lathe has been designed for handling small steel parts, difficult to hold in lathe chuck or collet. This unit will handle steel parts from 2- to 5-in. in diameter. Face plate of magnetic chuck is interchangeable to accommodate different sizes and shapes of parts. It is mounted on motor shaft and d.c. supply for chuck is self contained. Units can be furnished in conventional motor speeds from 600 to 3600 rpm., in both single and two speed motors. The Lima Electric Motor Co., Lima, Ohio.



LIMA ELECTRIC LATHE

TO OUR FRIENDS

A Statement from the President of Victor Electric Products, Inc.

★ ★ ★

Our production facilities are now partially engaged in war production. This will increase.

★

Therefore, production of In-Bilt Ventilators is temporarily restricted. When the crisis is over, we will offer a better product than ever. Meanwhile, we advise electrical contractors to check with your nearest distributor for In-Bilts still available for present needs, or write us direct for such dealers.

★

Remember, In-Bilt Ventilators can still be had for approved defense housing, or for non-defense housing already under construction. On such projects we are ready to extend every possible cooperation.

C. L. Harrison President

**VICTOR ELECTRIC
PRODUCTS, INC.**
CINCINNATI, OHIO



DEALERS-Sell

TORK CLOCKS

TURN ANYTHING ELECTRICAL
ON AND OFF REGULARLY

**Four
Little
Giant
Models**



Self-Starting

Ratchet Setting Dial; One Minute Accuracy; Hinged Cover; Lots of Room; 12 Knock-outs; 1 R.P.M. Indicator

191 A—Single Pole, 20 Amp.	\$13.00
1191 —Single Pole, 35 Amp.	14.00
962 A—Double Pole, 20 A. ea.	15.00
1962 —Double Pole, 35 A. ea.	16.00
Apt. House, 2-S.P. Circuits	25.00
Sixty Minute and Four Hour Timers	

DEALERS PROFIT

Single	30%
2 or more.....	35%

**CARRIED BY
JOBBER
EVERYWHERE**

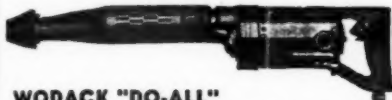


The Tork Clock Co.
MOUNT VERNON, NEW YORK

WHERE TO BUY

Equipment, Materials and Supplies for
Electrical Construction—Maintenance—Repairs

DRILLS CONCRETE—METAL—WOOD



WODACK "DO-ALL" ELECTRIC HAMMER AND DRILL

Saves time and money installing expansion anchors. Drills concrete to 1 3/8" dia.; metal to 3/4". Two tools in one. Easy to maintain. Universal motor. Write for folder.

Wodack Electric Tool Corporation
4628 W. Huron St. Chicago, Ill.
Telephone ATtain 0966

Electric Operators
For Any Overhead Type Door
DOORS AND OPERATORS INC.
See page 295
Elec. Burs. Ref. TIFFIN, OHIO

TEST-O-LITE

Tests Everything Electrical
From 100 to 550 Volts
Indispensable to electricians.
Equipped with Neon light
which tells instantly where
trouble lies in electric circuits,
fuses, cut-outs, motors, radios,
electric appliances; indicates
hot or grounded wires; tells
A.C. from D.C.



Only TEST-O-LITE, original
Neon tester, has exclusive
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Far superior to clumsy test
bulb. Fountain pen size
with pocket clip. Useful in
homes also.

List \$1.50
at leading jobbers.

L. S. BRACH
MANUFACTURING CORPORATION
57 Dickerson St., Newark, N. J.



SEARCHLIGHT SECTION

(Classified Advertising)

Employment Business
Equipment

(Used or Resale)

"OPPORTUNITIES"

UNDISPLAYED RATE

15 Cents a Word, Minimum Charge \$3.00. POSITIONS WANTED (full or part time salaried employment only), 1/2 the above rates payable in advance.

BOX NUMBERS—Care of publication New York, Chicago or San Francisco offices count as 10 words. DISCOUNT OF 10% if full payment is made in advance for 4 consecutive insertions.

DISPLAYED RATE

INDIVIDUAL SPACES with border rules for prominent display of advertisements.

The advertising rate is \$8.00 per inch for all advertising appearing on other than a contract basis. Contract rates quoted on request. AN ADVERTISING INCH is measured 1/4" vertically on one column, 3 columns—50 inches—to a page.

NEW ADVERTISEMENTS received by February 18th will appear in the March issue, subject to limitations of space available.

POSITION VACANT

ELECTRICAL ENGINEER, with considerable editorial experience, for position on editorial staff of leading industrial paper. College publication experience will count. Should be between 30 and 38. Give age, education, experience, present connection, salary expected. Include photograph. All replies will be held in strict confidence. P-30, Electrical Contracting, 330 W. 42nd St., New York, N. Y.

3AG LITTELFUSES



UNDERWRITERS' APPROVED. Modern space-saving efficient Littelfuses replace old cartridge types and big mountings. 16 sizes, 1/100 to 8 amps. Send for catalog.

LITTELFUSE INC. 4789 RAVENSWOOD AVE. CHICAGO, ILLINOIS



ALLEN Flux for STAINLESS STEEL

For production, maintenance, and repair work. Works with all solders—fast—easy. Send for free samples.

L. B. ALLEN CO., INC.
6715 Bryn Mawr Ave., Chicago, Ill.

Low Cost! ZENITH MAGNETIC CONTACTORS Quick Delivery



Electrically Held—Mechanically Held for all types of installations. Copper to copper contacts with rolling and sliding action. 30 to 600 amps., A.C. and D.C., 1 to 4 poles.

CATALOG. Save money with Zenith Automatic Control Equipment. Catalog free.

ZENITH ELECTRIC CO.

845 S. Wabash Avenue Chicago, Ill.

USED EQUIPMENT FOR SALE

WE BUY AND SELL
MOTORS
TRANSFORMERS
MOTOR GEN. SETS
OIL SWITCHES
AIR CIRCUIT BREAKERS
ELECTRIC EQUIPMENT CO.
347 N. Clinton Ave., Rochester, N.Y. Tel: Main 252

Your inquiry

will have special value . . .

If you mention this magazine, when writing advertisers. Naturally, the publisher will appreciate it . . . but more important, it will identify you as one of the men the advertisers wants to reach with his message & help to make possible enlarged future service.

One Inexpensive Modern Device

can frequently help speed up your installation and maintenance work.

One product advertised in the "Where To Buy" Section may be the answer to your problem . . .

To be informed—and reminded—on modern aids to economical installation and maintenance, check the "Where To Buy" advertising . . . every issue.

the improved conduit fittings—offer you a range of choice that covers all requirements of industrial plant wiring, including explosion-proof and dust-tight types for hazardous locations. Write for your copy of Pylet Catalog 1100 with complete listings of all types.



—designed for simpler installation, greater strength, and maximum security of wiring. Self-aligning covers.

—self-aligning covers, heavy duty bodies, tops with square corners to take standard switch and receptacle plates.



—all types, for surface, outlet box, handrail, wall mounting; single, two and three gang, for lamps 10 to 200 watts.



for mercury vapor, reflector, and fluorescent fixtures, flexible types for pendant fixtures, and hooks and loops for messenger wire suspension.



for tumbler, push-pull, rotary, and safety knife switches, with or without fuses.

heavy duty threaded or bolted cover types, with threaded hubs or thick wall type—tapped to order, for junction and terminal block installations.



—a complete range of types and sizes, from Midget Triploc types for lights and portable tools to QuolArc circuit breaking types, ratings up to 200 amperes.

The Pyle-National Company
1344 North Kostner Avenue
Chicago, Illinois

February, 1942

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REFLECTORS
IMPORTANT UNITS
FOR QUICK LAYOUT
CHANGES



IDEALITE



FLUORALINE



FLUROLITE

The MULTI line contains modern units that are in great demand today because of extreme flexibility to meet urgent need for expansion, change, etc. Send for complete bulletin.

MULTI
ELECTRICAL MANUFACTURING CO.
1840 W. 14th ST., CHICAGO, ILL.

KEEP 'EM WARM



...with this extra, portable heat

In the playroom, in the bathroom, in the living room—wherever it's needed—Thermador Portable Electric Heaters provide clean, healthful, extra warmth. Attractively designed, extremely light, amazingly economical—these efficient little heaters are the modern answer to chilly mornings and evenings. You'll like their looks, their economy, their comforting warmth.

Available in three models as illustrated below.



Seven Leaguer



Spred-Ray



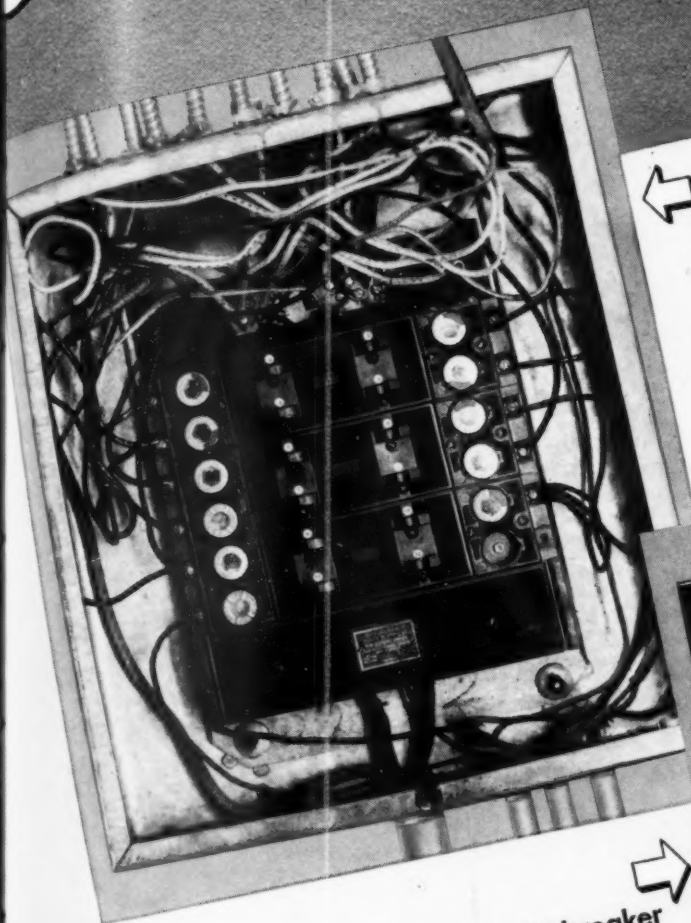
Heat Fan



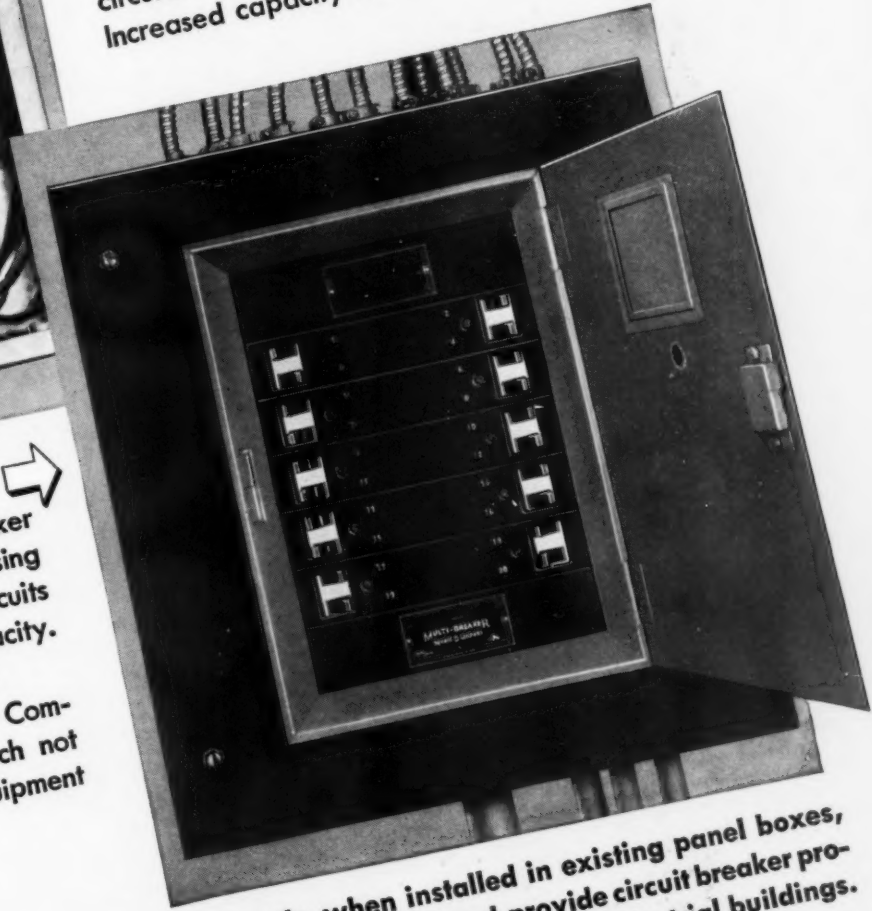
THERMADOR

5119 SO. RIVERSIDE DRIVE, LOS ANGELES, CALIF.
230 MADISON STREET, OAKLAND, CALIFORNIA

Picture Story!



← **BEFORE** the West Penn Power Company modernized this panel, located on its property in New Kensington, it presented the picture shown at the left. A fusible type panel, it provided 12 lighting and power circuits. It was obsolete and overloaded. Increased capacity was needed.



→ **AFTER** installing the new Multi-breaker panelboard, in the same box and using the same conduit. An increase in circuits from 12 to 20—66 $\frac{2}{3}$ % more capacity. An easy, economical transformation. West Penn is one of many Power Companies throughout the country which not only promotes Multi-breaker equipment but uses it to advantage.

FACT: Multi-breaker lighting and distribution panels, when installed in existing panel boxes, usually increase the number of circuits by more than 50% and provide circuit breaker protection. Thus, they solve a problem which exists in scores of commercial and industrial buildings.

MULTI-BREAKERS ARE NON-TAMPERABLE

CALL IN A

SQUARE D COMPANY
DETROIT - MILWAUKEE - LOS ANGELES
KOLLSMAN INSTRUMENT DIVISION, ELMHURST, NEW YORK
IN CANADA: SQUARE D COMPANY CANADA LIMITED, TORONTO, ONTARIO

SQUARE D MAN

From White River Junction to San Diego

G-E Wiring Materials Distributors want to cooperate with you in working for U. S. Victory



M. N. Snyder, 20 years with the General Electric Supply Corporation, Cleveland, Ohio, is always eager to explain his line when talking with customers. Here he is describing G-E switches to W. D. Ford, one of the purchasing agents of the Aluminum Company of America.

Starting the day with a smile Jim Santorelli, construction materials specialist at the General Electric Supply Corporation, White Plains, N. Y., goes off to call on customers eager to help them. He likes to demonstrate products at every opportunity.



Like other distributors, G. W. Knowlton, (left) sales manager at the Des Roberts Electrical Supply Co., Lynn, Mass., wants to provide his customers with materials especially for war projects and at the same time be able to replace his stocks. Therefore, he gives his customers all information possible on priority procedure as he is doing above for B. A. Marshall, local contractor.



O. E. Frankenbush, vice president of the Hawkins Electric Co., Chicago, Ill., is famous for his use of the telephone in conducting business. He is in charge of all internal sales and handles practically all of his estimating and contracting over the telephone.

Sure, there are a lot of G-E Wiring Materials Distributors in business today . . . many scores of them stretched across this busy country of ours. But that's a matter of mere geography.

Far more important to you is the fact that the G-E Wiring Materials Distributor in your locality is equipped to help you with ideas . . . service . . . products . . . experienced manpower.

You'll find it reassuring to talk with a representative of YOUR G-E Wiring Material Distributor. You'll find that he is eager to cooperate with you in contributing to U. S. war efforts.

Ask him what electrical raceway to specify for an unusual installation . . . the most suitable cable insulation for a particular requirement . . . what steps must be taken to obtain work in this emergency. If he doesn't have the answers on the tip of his tongue, he'll know where to find them quickly.

G-E Wiring Materials Distributors can tell you about G-E Wiring Materials: Conduit Products, Wires and Cables, Wiring Devices. Ask YOUR G-E Wiring Materials Distributor about them today. Appliance and Merchandise Department, General Electric Co., Bridgeport, Conn.



GENERAL ELECTRIC

